U.S. FISH and WILDLIFE SERVICE'S
BIOLOGICAL and CONFERENCE OPINION
for the
PROPOSED ISSUANCE
of a
SECTION 10(a)(1)(B) INCIDENTAL TAKE PERMIT
(PRT- TE044757-0)
to the
TACOMA PUBLIC UTILITIES, TACOMA WATER
for the
GREEN RIVER WATER SUPPY OPERATIONS AND WATERSHED PROTECTION HABITAT CONSERVATION PLAN

July, 2001

TABLE OF CONTENTS

Biological and Conference Opinion for the Issuance of an Incidental Take Permit to the Tacoma Public Utilities, Tacoma Water for the Green River Water Supply Operations and Watershed Protection Habitat Conservation Plan

INTRODUCTION

This document constitutes the U.S. Fish and Wildlife Service's (FWS) biological and conference opinions prepared pursuant to section 7 of the Endangered Species Act of 1973 (Act), as amended, on the effects of issuing an incidental take permit (Permit) to the City of Tacoma, Public Utilities, Tacoma Water (Tacoma) for 26 fish and wildlife species (see Table 1.), pursuant to section 10(a)(1)(B) of the Act. These opinions are based on FWS's review of the proposed Green River Water Supply Operations and Watershed Protection Habitat Conservation Plan (HCP) for Tacoma's headworks and their lands located in southwestern King County, Washington, and it's effects on the marbled murrelet, northern spotted owl, bald eagle, grizzly bear, gray wolf, bull trout, and Canada lynx in accordance with section 7 of the Act (16 U.S.C. 1531 et seq.). As per the new No Surprises Regulations (Fed. Reg. Vol. 63, No. 35, Pp. 8859-8873), FWS has also prepared conference opinions for the other covered species (all currently unlisted species) addressed by this HCP. Concurrently, the National Marine Fisheries Service (NMFS) is preparing a companion biological opinion/conference opinion on the anadromous salmonids under it's purview, including chinook salmon(currently listed as threatened in the Puget Sound region), coho salmon, sockeye salmon, and steelhead. The proposed incidental take for the 25 listed and unlisted species would occur as the result of on-going water supply operations and forest management activities in the watershed consistent with the HCP, the Environmental Impact Statement (EIS) and the Implementation Agreement (IA).

Table 1. Species Included in Tacoma's Multi-Species Habitat Conservation Plan

Endangered
Gray Wolf, *Canis lupus*

Threatened
Bald Eagle, *Haliaeetus leucocephalus*
Bull Trout, *Salvelinus confluentus*
Canada Lynx, *Lynx canadensis*
Marbled Murrelet, *Brachyramphus marmoratus*
Northern Spotted Owl *Strix occidentalis*
Grizzly Bear, *Ursus arctos*
Chinook Salmon, *Oncorhynchus tshawytscha**

Proposed:
Dolly Varden *Salvelinus malma*

Candidate:
Oregon-spotted Frog, *Rana pretiosa*

Other covered species:
California Wolverine, *Gulo gulo*
Cascade Frog, *Rana cascadae*
Cascade Torrent Salamander, *Ryacotriton cascadae*
Chum Salmon, *Oncorhynchus keta**
Coastal Cutthroat Trout, sea run, *Oncorhynchus clarki clarki*
Coho Salmon, *Oncorhynchus kisutch**
Common Loon, *Gavia immer*

Larch Mountain Salamander, *Plethodon larselli*
Northern Goshawk, *Accipiter gentilis*
Northwestern Pond Turtle, *Clemmys marmorata*
Olive-sided Flycatcher, *Contopus borealis*
Pacific Fisher, *Martes pennanti*
Pacific Lamprey, *Entosphenus tridentatus*
Peregrine Falcon, *Falco peregrinus*
Pileated Woodpecker, *Dryocopus pileatus*
Pink Salmon, *Oncorhynchus gorbuscha**
River Lamprey, *Lampetra ayresi*
Sockeye Salmon, *Oncorhynchus nerka**
Steelhead, *Onchorynchus mykiss**
Tailed Frog, *Ascaphus truei*
VanDyke's Salamander, *Plethodon vandykei*
Vaux's Swift, *Chaetura vauxi*

* *denotes species under the jurisdiction of NMFS*

CONSULTATION HISTORY

From January 1998 to January 2000 the U.S. Fish and Wildlife Service and the National Marine Fisheries Service (collectively referred to as the Services) provided technical and policy assistance to City of Tacoma Public Utilities, Tacoma during the development of their Green River Water Supply Operations and Watershed Protection HCP. Species lists of endangered, threatened, and proposed species known to occur in the Green River Watershed were prepared and updated by the FWS throughout the development of the HCP. The latest of these letters was prepared and signed by the Services on November 27, 2000 (FWS Ref.# 1-3-01-SP-0101).

Tacoma first submitted a preliminary working draft of a conservation plan to the Services in September 1998. In November of 1998, Tacoma submitted the first working draft of the HCP to the Services, as well as, the U.S. Environmental Protection Agency (EPA), U.S. Army Corps of Engineers (COE), Muckleshoot Indian Tribe, and several Washington State resource agencies. In addition, copies of this draft were placed in six public libraries for citizen review and comment. A second working draft of the HCP was submitted to the Services in July of 1999. This draft was also mailed to other federal, state, and local governmental agencies, and the Muckleshoot Indian Tribe for review and comment prior to the development of the final draft HCP.

During the development of final draft HCP, the Services also were working with Tacoma to develop an Environmental Impact Statement (EIS) and Implementing Agreement (IA) to accompany the HCP. Tacoma submitted final draft documents of the HCP, EIS, and IA with their formal application for an incidental take permit on December 23, 1999. On January 14, 2000, the Services initiated a 60-day public comment period under the National Environmental Policy Act of 1969 (NEPA), as amended, (63 FR 68469). The comment period was extended an additional 17 days ending on March 31, 2000. The final 30-day review period for the final EIS, HCP, and IA was initiated on January 5, 2001.

BIOLOGICAL AND CONFERENCE OPINION

DESCRIPTION OF THE PROPOSED ACTION

Tacoma has prepared a multiple species HCP to comply with the federal Act (16 U.S.C. 1531 et seq.) and address water supply and forestry resource management issues. The 50-year plan will cover Tacoma's water supply operations at their headworks facility and timber resource management actions on 14,888 acres of Tacoma owned lands in the upper Green River Watershed. The HCP is a set of habitat conservation measures and stewardship actions designed to avoid, minimize, and mitigate the effects of Tacoma's water withdrawal and forestry management activities on fish and wildlife in the Green River and in the upper Green River Watershed.

Tacoma's habitat conservation measures and stewardship actions are summarized in Table 5.1 of the HCP. The HCP divides the measures into three distinct categories: Type 1 - implementation measures designed to offset or compensate for impacts resulting from Tacoma's water withdrawal actions; Type 2 - contribution of funds and/or implementation of measures designed to offset or compensate for impacts from activities that Tacoma is partially funding or

implementing (i.e. gravel nourishment, large woody debris supplementation); and Type 3 - implementation of mitigation and restoration measures in the Green River Watershed designed to offset impacts of Tacoma non-water withdrawal activities (i.e. forestry operations). The list of habitat conservation measures and stewardship actions committed to in the HCP by Tacoma reflects, in part, commitments made by Tacoma in the 1995 Muckleshoot Indian Tribe/Tacoma Public Utility Mitigation Agreement.

Action Area

The action area for this biological and conference opinion, by regulation (50 C.F.R. 402.02) includes "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action". The proposed federal action, in this case, is the issuance of the Permit under section 10 of the Act. The action area by definition is Tacoma Water's ownership in the upper Green River Watershed, other lands in the upper Green River Watershed, as well as the Green River from its headwaters to the point of tidal influence at approximately river mile 11.0 (Figures 1.1 and 1.2).

Changed and Unforseen Circumstances

Tacoma could be required to provide additional mitigation in accordance with the HCP and IA in response to several identified changed circumstances. The HCP identifies seven events for which provisions of changed circumstances would apply; wildfire, wind, landslide, flood, forest health, changes in the structure and operation of Howard Hanson Dam (HHD), and eminent domain affecting lands in the HCP area. In response to an event that has reached or exceeded threshold criteria for any of the listed changed circumstances, Tacoma and the Services will implement measures agreed upon in Section 3.2.3 of the HCP. If additional mitigation measures or costs are needed beyond that described in Section 3.2.3, the Services will not require any such additional measures or costs of Tacoma without their prior consent.

Adaptive Management

Adaptive management in the context of HCPs is viewed as an agreement with the applicant whereby their contribution to the conservation of the species or habitats will change (increase or decrease) in response to new information. Adaptive management is needed when there is not sufficient information at the time of HCP development regarding the operation of natural systems or the relationship of species habitat requirements to changing landscape conditions. It may also be applied when the Services and the applicant cannot agree on a set of prescriptions for a species because they differ in their views of what is needed.

Adaptive management or research monitoring as it is referred to in the Tacoma HCP address three primary areas of uncertainty with respect to natural resources of the Green River. These three areas are 1) downstream fish passage through the reservoir and HHD, 2) flow management of the middle and lower Green River, and 3) sediment and woody debris transport below Tacoma's headworks dam. A description of the research measures that need further study, the research issues, the research activities, and cost of the activities to address the identified uncertainties can be found in Table 8-2 of the HCP. As the science surrounding the research

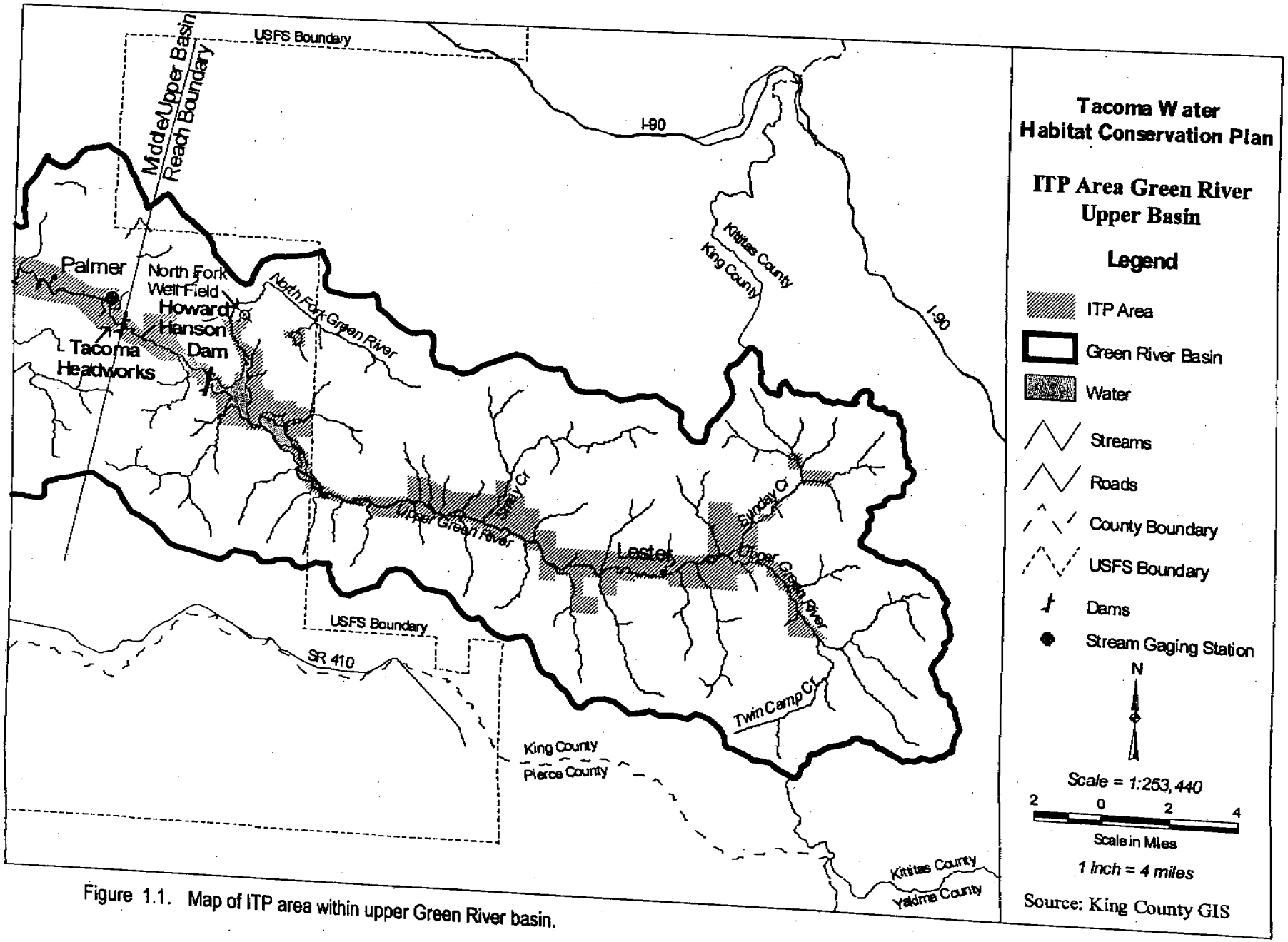

Figure 1.1. Map of ITP area within upper Green River basin.

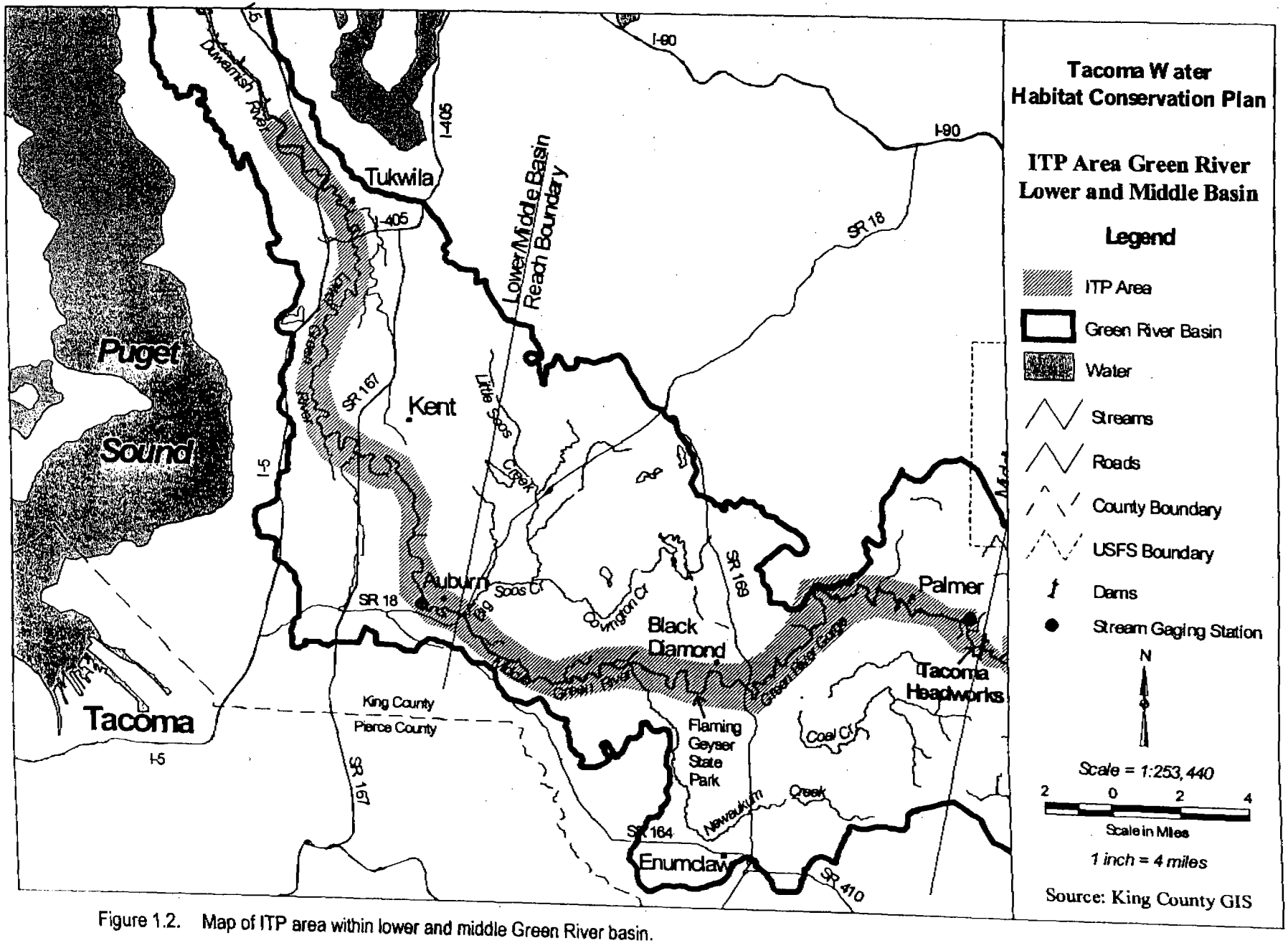

Figure 1.2. Map of ITP area within lower and middle Green River basin.

issue for some measures becomes more refined and understandable, monies committed to that issue by Tacoma can be reallocated to other research monitoring issues.

Conservation Measures

Type 1 measures are habitat conservation measures designated to offset or compensate for impacts to fish resulting from Tacoma's water withdrawal activities at its headworks facility located at RM 61.0. Specifically, Tacoma has committed to five measures to address the following habitat conditions at and below the headworks dam: instream flows below their headworks facility, habitat conditions above their headworks facility, upstream fish passage for adult salmonids, and downstream passage for juveniles through HHD and around their headworks facility. These measures are summarized as follows. Tacoma will provide for minimum instream continuous flows at the Auburn gage for different summer weather conditions during the period of July15 to September 15 for the term of the HCP. Tacoma has also committed to a second set of minimum instream flows that are in addition to those mentioned previously and are to be met prior to Tacoma withdrawing water under its Second Diversion Water Right. Tacoma has also proposed to modify the existing headworks facility by adding an adult fish ladder and a trap and haul facility. The combination of a fish ladder and a trap and haul facility, will allow Tacoma to capture and transport fish not only around their headworks facility but also around HHD, thereby, providing access for anadromous fish to the upper third of the Green River that has been completely closed or partially closed to anadromy since 1913. As a complementary measure, Tacoma will modify the existing headworks through the use of fish screens, a fish by-pass system to eliminate the potential that downstream migrating juveniles and adults could enter the headworks water intakes, and a reconfiguration of the area immediately below the headworks dam to improve the survival of fish migrating over the dam. The final measure under Type 1 habitat conservation measures commits Tacoma to placing large woody debris and root wads within two pool lengths of the modified headworks to provide rearing areas for juvenile salmonids. Section 5.1 of the HCP provides a more complete description of the Type 1 measures, explanations of these measures' objectives, and the rationale and ecosystem benefits of the individual measures.

Type 2 measures are habitat conservation measures that are designed to offset or compensate for impacts to fish resulting from activities that Tacoma is partially funding or implementing. There are 11 Type 2 measures in the HCP. These measures include, but are not limited to: downstream fish passage at HHD; downstream woody debris management program for large and small woody debris collected above HHD; mainstem gravel nourishment; and snowpack and precipitation monitoring to better predict stream flows. Section 5.2 of the HCP provides a more complete description of the Type 2 measures, explanations of these measures' objectives, and the rationale and ecosystem benefits of the individual measures.

Type 3 measures are habitat conservation measures and stewardship actions that are designed to offset the impact to covered species of Tacoma activities not associated with the operation of Tacoma's water supply system on the Green River. The measures address upland forest management, riparian buffers, and species-specific actions to address impacts that result mainly from Tacoma's forestry related activities in the upper Green River Watershed. The HCP designates three forest management zones (Natural, Conservation, Commercial), the amount of

acres in each zone, and the manner in which each zone will be managed. The Natural Zone contains 5,850 acres. Tacoma proposes to conduct no timber harvest management in this zone except for the selective removal of danger trees within 150 feet of roads. The long-term goal is to allow these stands to develop into late-seral conditions through natural succession.

The Conservation Zone contains 5,180 acres. In the Conservation Zone, Tacoma will conduct uneven-aged management of timber resources in conifer dominated stands less than a 100 years old for the purpose of accelerating and enhancing late-seral forest conditions. No timber harvest will occur in stands that are currently 100-years old or older. This will allow stands to develop mature and late-seral conditions through natural succession. Stands that reach at least 100 years old during the life of the HCP will not be subject to further timber harvest and will be allowed to develop similar forest mature and late-seral characteristics as stands in the Natural Zone and other parts of the Conservation Zone.

The Commercial Zone contains 3,858 acres. Tacoma will manage coniferous stands in the Commercial Zone on an even-aged harvest rotation of 70-years. No more than 1.5 percent (approximately 58 acres) of the conifer-dominated lands will be harvested in any given year during the life of the HCP. Snags, green recruitment trees, and log will be retained as specified in the HCP. Revenue generated from the harvest of commercial lands will used to fund measures required by the HCP and finance the acquisition of additional lands in the watershed.

The HCP also provides for riparian buffers along streams and around wetlands in the plan area. Washington Department of Natural Resources' (WDNR) stream typing will be used to determine the buffer protection each stream or wetland will receive. For streams, type 1 and 2 streams will be buffered with a minimum of 200-foot no-harvest buffers; Type 3 streams will be buffered with 150-foot no-harvest inner buffers and 50-foot partial-harvest outer buffers; Type 4 streams will be buffered with 50 to 100-foot no-harvest buffers depending a stream reach; and Type 5 will be buffered with 25-foot no-harvest inner buffers and 25-foot partial-harvest outer buffers. For wetlands, all Type A wetlands greater than 5 acres in size will receive 200-foot no-harvest buffers, all Type A wetlands ranging in size from 0.5 acres to 5.0 acres will receive 100-foot no-harvest buffers, and Type A bogs and fens of 0.25 acres to 0.5 acres will also receive 100-foot no-harvest buffers. All Type B wetlands greater than 5.0 acres will receive 100-feet no-harvest buffers and all Type B wetlands 0.25 acres to 5.0 acres will receive 50-foot no-harvest buffers. All type C wetlands greater than 5.0 acres will receive 50-foot no-harvest buffers and Type C wetlands 0.5 acres to 5.0 acres will receive 25-foot no-harvest buffers. Non-forested wetlands smaller than 0.25 acre and forested wetlands smaller than 0.50 acre will not be buffered in the Commercial Zone or portions of the Conservation Zone eligible for harvest.

Species-Specific Conservation Measures

In additions to the designation of the natural, conservation, and commercial forest management zones; the establishment of riparian buffers; the retention of snags, green recruitment trees, and downed logs double that of the existing state requirements; and the establishment of road

maintenance guidelines, Tacoma has developed species-specific measures for six federally listed species and one federally proposed species as well as other covered species. Tacoma will also notify the FWS of any reported sighting of a marbled murrelet, grizzly bear, gray wolf, Pacific fisher, California wolverine, or Canada lynx in the upper HCP area.

Gray Wolf

Tacoma will not conduct timber felling, yarding, road construction, blasting, or use helicopters for commercial timber harvest and silvicutural activities within 1.0 mile of any known active gray wolf den from March 15 through July 15. Tacoma will also not conduct timber felling, yarding, road construction, blasting, or use helicopters for commercial timber harvest and silvicutural activities withing 0.25 mile of any active "first" rendezvous site from May 15 through July 15. Tacoma will consult with FWS prior to conducting harvest-related activities outside the denning season within 0.25 mile of known den sites. Tacoma will prohibit firearms within the vehicles of contractors working for Tacoma and restrict public access to the watershed.

Bald Eagle

Tacoma will not conduct timber felling, yarding, road construction, or other habitat alterations within 0.25 mile (or 0.50 mile within the direct line of sight), use helicopters for commercial timber harvest and silvicutural activities within 0.50 mile, or blast within 1.0 mile of any active bald eagle nest from January 1 through August 31 and bald eagle communal roost from November 15 through March 15. Restrictions around nest will apply 24 hours per day and restrictions around communal roosts will apply one hour before sunset to one hour after sunrise. Tacoma will also conduct no timber felling or other habitat alterations within 400 feet of any bald eagle nest or communal winter roost in the upper Green River Watershed at any time.

Canada Lynx

Tacoma will not conduct timber felling, yarding, road construction, blasting, or use helicopters for commercial timber harvest and silvicultural actvities within 0.50 mile of any active Canada lynx den site and potential denning habitat from May1 to July 31.

Grizzly Bear

Tacoma will not conduct timber felling, yarding, road construction, or use helicopters for commercial timber harvest and silvicutural activities within 1.0 mile of any active grizzly bear den site from October 1 through May 31. At other times, Tacoma will consult with FWS prior to any timber harvest or road construction within 3 miles of a grizzly bear den. Tacoma will suspend all forest management and road construction activities under its control in the upper HCP area within 1.0 mile of confirmed grizzly bear sightings for 21 days. Tacoma will not construct roads across non-forested blueberry fields, black huckleberry fields, meadows, avalanche chutes or wetlands in the upper HCP area. If a grizzly bear is documented in the Green River Watershed, Tacoma will retain visual screens along the margins of the above mentioned habitats. Tacoma will continue to implement strict measures to prevent the dumping

of trash that may attract bears. Tacoma will also prohibit firearms in the vehicles of contractors working for Tacoma in the upper HCP area and restrict public access to the upper watershed.

Marbled Murrelet

Tacoma will not conduct timber felling, yarding, road construction, within 0.25 mile, use helicopters for commercial timber harvest and silvicutural activities within 0.50 mile, or blast within 1.0 mile of habitat where either "occupancy" by murrelets has been documented, "presence" has been documented but occupancy has not yet been determined, or where suitable unsurveyed habitat exists.

Northern Spotted Owl (mitigation and minimization measures)

Tacoma will conduct no timber felling, yarding, road construction, or aircraft activity within 0.25 mile, or blasting within 1.0 mile of the activity center of any spotted owl pair from March 1 through June 30. Tacoma will also conduct no timber felling or other habitat alterations within 660 feet of the activity center of any spotted owl pair or resident single located in the upper Green River Watershed unless through proper protocol surveys that the given activity center has been unoccupied for at least 36 months.

California Wolverine (covered species)

Tacoma will not conduct no timber felling, yarding, road construction, blasting, or use helicopters for commercial timber harvest and silvicutural activities within 0.50 mile of any active wolverine den site between October 1 and May 31.

Larch Mountain Salamander

Tacoma will survey potential Larch Mountain salamander habitat and protect occupied habitats where Tacoma proposes to conduct timber harvest and other activities that would reduce forest cover, remove or disturb coarse woody debris, or substantially disturb coarse, unconsolidated substrate. Habitat found to be occupied by Larch Mountain salamander will be protected and buffered with 50-foot no-harvest buffers. New roads will be rerouted around occupied habitat unless the new road would be substantially longer or the alternate location would have greater impacts to fish and wildlife. The total area protected per planned project activity (e.g. harvest unit, road segment) can not exceed 10 percent of the project footprint. When occupied habitat covers more than 10 percent of the area, Tacoma and FWS will determine which areas will receive protection under this measure.

Northern Goshawk

Tacoma will not conduct timber felling, yarding, road construction within 0.25 mile, use helicopters for commercial timber harvest and silvicutural activities within 0.50 mile, or blast within a 1.0 mile of any northern goshawk nest from March 1 through August 31. Tacoma will also conduct no timber felling or habitat alternation within 660 feet of any goshawk nest in the upper HCP area, unless it has been determined to be unoccupied for at least 8 consecutive years.

Northwestern Pond Turtle

Tacoma in consultation with FWS will prepare site-specific protection plans to minimize impacts to northwestern pond turtles, if turtles are found to occur in or near covered lands, and if it is determined that one or more covered activities has the potential to impact this species.

Pacific Fisher

Tacoma will not conduct timber felling, yarding, road construction, blasting, or use helicopters for commercial timber harvest and silvicutural activities within 0.50 mile of any active Pacific fisher den site between February 1 and June 30.

Peregrine Falcon

Tacoma will not conduct timber felling, yarding, road construction, or use helicopters for commercial timber harvest and silvicutural activities within 0.50 mile, or blasting within a 1.0 mile of any peregrine falcon nest from March 1 through July 31. In addition, Tacoma will conduct no timber felling or other habitat alteration at any time within 100 feet of any peregrine falcon nest site and all potential nest cliffs greater than 75 feet in height on the upper Green River Watershed. During timber harvest of stands within 660 feet of peregrine falcon nest sites, Tacoma will retain all dominant trees that are significantly larger and taller than other trees in the stand and extend above the canopy.

Pileated Woodpecker

Tacoma will give preference to leaving green recruitment trees with visible signs of pileated woodpecker nesting, roosting, and foraging when selecting trees to meet other habitat conservation measures. All safe snags on covered lands will be retained.

Vaux's Swift

Tacoma will give preference to leaving green recruitment trees with visible signs of Vaux's swift nesting or roosting and those with potential for future use when selecting trees to meet other habitat conservation measures. Tacoma will also attempt to buffer these trees with other green recruitment trees to protect them from windthrow and to moderate climate at potential roost trees. All safe snags on covered lands will be retained.

STATUS OF THE SPECIES (rangewide)

Listed species/critical habitat:

Gray Wolf

On June 4, 1973, the gray wolf, *Canis lupus*, was federally listed as endangered throughout the lower 48 States except in Minnesota, where it was listed as threatened on March 9, 1978. In compliance with the Act, FWS released a Northern Rocky Mountain Wolf Recovery Plan in

1987 (FWS 1987). In 1930, it was believed that breeding populations of wolves in Washington were extinct because of fur trading pressure in the 1800's followed by the establishment of bounties on all predators in 1871 in the Washington Territory (Young and Goldman 1944). The last reported wolf shot in Washington was in 1975 in the North Cascades (WDW 1975, as reported in Almack et al. 1994). Recent observations indicate that wolves exist in Washington, likely in small numbers, and mostly as individuals. However, several family units have been documented, indicating that some level of reproduction has occurred recently (Almack and Fitkin 1998).

Historically, gray wolves ranged widely in temperate forests throughout North America (Paradiso and Nowak 1982; Bangs 1991). However, by the late 1930's, few, if any, wolves remained in the Northern Rocky Mountain region (FWS 1987), and as of 1988, wolf populations were scattered throughout Alaska, Minnesota, Michigan, Wisconsin, Montana, Idaho, and Washington. The 1987 Recovery Plan specifies three recovery areas in the northern Rocky Mountains: the Yellowstone Recovery Area, including and surrounding Yellowstone National Park; the Northwestern Montana Recovery Area, including and surrounding Glacier National Park; and the Central Idaho Recovery Area. The criteria for selecting these three recovery areas includes the presence of a prey base sufficient to support ten breeding pairs of wolves, and a minimum of 3,000 square miles, of which less than ten percent is private ownership, except "railroad land grants" (FWS 1987). According to the recovery plan, maintaining at least ten breeding pairs in an area for at least three years will result in reclassifying wolves in the area as threatened rather than endangered. When at least ten breeding pairs have been maintained for at least three years in all three recovery areas, the species will be delisted (FWS 1987). Although there is currently no recovery plan written for the Washington Cascade Mountains; the Washington Department of Fish and Wildlife (WDFW) is conducting surveys to determine the number and distribution of gray wolves in the Cascades.

Species Description

The species, *Canis lupus*, includes 32 subspecies or geographic races occurring around the world, 24 of which are in North America (Mech 1970). The gray wolf is a large canid with longer legs and proportionally larger feet than coyotes or domestic dogs. Colors range from white, cream, tawny, shades or gray, to black. The belly and legs are often lighter and the back and top of the tail is darker than the rest of the body (Ream and Matson 1982). Adult male wolves generally weigh between 80 to 100 pounds; females are slightly smaller. Adults range between 4.5 to 6.5 feet from the tip of the nose to end of the tail, and they stand 26 to 32 inches in height at the shoulders.

Age and Sex Characteristics

Sex ratios in wolf populations from several areas in the northern hemisphere are biased towards males (Mech 1970). Wolves held in captivity have showed a slightly larger (53:47) number of male pups. High-density wolf packs in northeastern Minnesota had a significantly higher number of males (66:34) in the population. In contrast, wolf packs from other areas of Minnesota with lower population densities had approximately equal sex ratios. Thus, the percentage of male wolf pups appeared to be proportional to population density and perhaps inversely related to estimated levels of nutrition (Mech 1975).

Ratios of pups to adults in wolf populations are strongly influenced by the degree of human exploitation. For example, pup to adult ratios in exploited (i.e., hunted) wolf populations range between 55:45 to 73:27. In unexploited populations, pup to adult ratios of 13:87 to 31:69 have been reported (FWS 1984). This suggests that exploited wolf populations are characterized by a relatively high proportion of pups.

Range and Distribution

At one time, the gray wolf had an extensive range, occurring throughout North America, Europe, Asia, and Japan, with the exception of vast deserts and high mountaintops in these regions. In North America, the wolf's range extended southward to the southern end of the Mexican Plateau (Mech 1970). Currently, the wolf's range is more restricted. Outside of Alaska, large populations exist in northern Minnesota and Isle Royale, Michigan, and small populations are scattered throughout Wisconsin, Montana, Idaho, and Washington.

Factors that seem to be responsible for wolf population declines within the United States include: (1) intensive human settlement; (2) direct conflict with domestic livestock; (3) a lack of understanding of the animal's ecology and habits; (4) fears and superstitions about wolves; and (5) the extreme control programs designed to eradicate the wolf (FWS 1987).

Home Range

Wolves are highly social animals, occurring in packs that number from 2 to more than 25 individuals (Mech 1970). The pack consists of a breeding male and female, often referred to as the alpha pair, and their offspring from one or more generations. While most wolves live in packs, young or subordinate wolves often leave existing packs in search of a mate and new territory. These lone wolves may find another lone wolf of the opposite sex, establish a territory, and begin a new pack. Packs establish and defend territories that vary in size from 48 square miles to over 981 square miles depending on pack size and prey density (Ballard et al. 1987; Mech et. al. 1987). Reproductively successful packs normally occupy exclusive territories, whereas nonbreeding loners live in the buffer zones between territories, avoiding the packs. The amount of available prey relative to numbers of pack members is important in determining the size of territories (FWS 1984).

Dispersal

Wolves disperse at ages ranging from 9 to 28 months. Dispersal usually occurs in the fall by juveniles ranging in age from 17 to 20 months. In low-density populations, juveniles of both sexes disperse into unoccupied areas on the periphery of the pack's territory. Following movement away from the pack, juveniles seek out another lone wolf of the opposite sex and form a new pack. In high-density populations, young animals may stay with the pack and wait for changes in the rank order and opportunities to mate. It is not unusual for subordinate wolves to disperse hundreds of miles to find a mate or unoccupied territory (Fritts and Mech 1981).

Breeding

Most wolves do not reach sexual maturity until at least 22 months (Wise et al. 1991). Alpha wolves are responsible for most of the successful matings, suggesting that reproduction after sexual maturity depends on social status (Peterson 1986). Wolves usually mate in February and

produce young 63 days later in litters of 1 to 11 pups (Mech 1970). The alpha pair as well as other members of the pack help gather food for the young-of-the-year. Wolves have high potential rates of population increase given favorable conditions. Summer population increases of 60 percent from the pre-breeding winter population have been recorded in Alberta (Fuller and Keith 1980).

Habitat Characteristics

The wolf has flexible habitat requirements. Wolves require an adequate food supply, suitable denning and rendezvous sites, travel corridors, and regulation of disturbances caused by humans (FWS 1987). Many endangered species face extinction because certain characteristics leave them vulnerable to disruptions caused by humans. This is not the case with wolves, which have high reproductive rates and flexible habitat needs (Wise et al. 1991), and they appear to be relatively unaffected by forest management activities. The major causes of the decline in wolf populations in the lower 48 States have been trapping, poisoning, and shooting as well as reduction in prey abundance (Mech 1970).

Wolves are found only where conditions will support an adequate prey base, comprised primarily of ungulates. In northern Montana, wolves prey mostly on white-tailed deer, elk, moose, and occasionally on mule deer (Ream et al. 1985). Elk remains accounted for 59 percent of the total weight of wolf scats collected near Glacier National Park (Giddings 1980). Remains of beaver, snowshoe hare, and other small mammals appear in wolf droppings and may be seasonally important. Prey species vary depending on their availability and abundance. Both the abundance and vulnerability of prey to wolf attacks helps to determine the content of wolves' diet (Wise et al. 1991). Prey/gray wolf relationships in the central Cascades are not well understood. Required prey resources may be patchily distributed in time and space and preferentially consumed by other predators as well affecting their availability for wolves. In any event, wolf populations may only be maintained, if, at a minimum, the area is capable of providing a year-round food supply and wolves are not shot or otherwise killed by humans.

Foraging

As stated above, wolves have extremely flexible habitat requirements, especially for foraging. Historically, wolves use various habitats across a rather broad spectrum of types. However, these habitats have two specific features in common: (1) an abundance of natural prey; and (2) minimal encounters and conflicts with human interests, such as livestock (FWS 1987). Habitat for wolves consists primarily of an adequate supply of vulnerable prey (ideally in an area with minimal opportunity for exploitation of wolves by humans) (FWS 1984).

Denning and Rendezvous Sites

Pups are born in early spring, usually in an underground den, abandoned beaver lodge, or hollow log (Peterson 1986). Typically, dens are located on south or southwest aspects of moderately steep slopes in well drained soils (or rock caves), at elevations less than 200 meters above the surrounding low-lying area, and usually within 200 meters of surface water (Mech 1970). Some den sites may receive traditional use by a wolf pack from year to year. Most wolf packs appear particularly sensitive to human disturbance near den sites and may, depending upon the extent of the disturbance, abandon the den (FWS 1984). After 6 to 10 weeks pups are moved from the

dens to rendezvous or post-denning sites. Rendezvous sites studied in Montana and Minnesota are described as resting, feeding, or activity sites occupied by wolves during summer and early fall months (Kaminski and Boss 1981). These sites usually include small (i.e., one acre or less), secluded bogs or complexes of meadows and adjacent hillside forests, in close proximity to surface water (Weaver 1978). Rendezvous sites are also characterized by matted vegetation in the meadow, a system of well used trails through the adjacent forest and resting beds adjacent to trees in the forest (FWS 1984). At this time, pups are unable to hunt and must remain at rendezvous sites where adults return with food. Wolves typically use two to three rendezvous sites while raising the young.

Bald Eagle

Status

On February 14, 1978, the bald eagle was federally listed throughout the lower 48 States as endangered except in Michigan, Minnesota, Wisconsin, Washington, and Oregon, where it was listed as threatened. The listing was the result of a decline in the bald eagle population throughout the lower 48 States. The decline was largely attributed to the wide-spread use of dichlorodiphenyltrichloroethane (DDT) and other organochlorine compounds in addition to destruction of habitat, illegal harassment and disturbance, shooting, electrocution from power lines, poisoning, and a declining food base. In Washington, the bald eagle is also listed as threatened by State of Washington.

Description

The bald eagle is a large eagle, having a white head and tail and brownish-black body as adults over five years old, and brown with whitish wing linings as immatures. The bill and legs are yellow.

A detailed account of the taxonomy, ecology, and reproductive characteristics of the bald eagle is presented in the Pacific States Bald Eagle Recovery Plan (USDI 1986), which includes Washington state, the final rule to reclassify the bald eagle from endangered to threatened in all of the lower 48 states (60 FR 36010), and the proposed rule to delist the bald eagle (64 FR 36454).

Habitat/Life History

Suitable habitat for bald eagles requires accessible prey and trees for nesting and roosting (Stalmaster 1987). Food availability, such as aggregations of waterfowl or salmon runs, is a primary factor attracting bald eagles to wintering areas and influences nest and territory distribution (Stalmaster 1987; Keister et al. 1987).

Bald eagle nests in the Pacific Recovery Area are usually located in uneven-aged stands of coniferous trees with old-growth forest components that are located within 1.0 mile of large bodies of water. Factors such as relative tree height, diameter, species, form, position on the surrounding topography, distance from the water, and distance from disturbance appear to influence nest site selection. Nests are most commonly constructed in Douglas-fir or Sitka spruce trees, with average heights of 116 feet and size of 50 inches diameter at breast height

(Anthony et al. 1982; cited in USDI et al. 1996). Bald eagles usually nest in the same territories each year and often use the same nest repeatedly. Availability of suitable trees for nesting and perching is critical for maintaining bald eagle populations.

A number of habitat features are desirable for wintering bald eagles. During the winter months bald eagles are known to band together in large aggregations where food is most easily acquired. The quality of wintering habitat is tied to food sources and characteristics of the area that promote bald eagle foraging. Key contributing factors are available fish spawning habitat with exposed gravel bars in areas close to bald eagle perching. Bald eagles select perches that provide a good view of the surrounding territory, typically the tallest perch tree available within close proximity to a feeding area (Stalmaster 1987). Tree species commonly used as perches are black cottonwood, big leaf maple, or Sitka spruce (Stalmaster and Newman 1979).

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Wintering bald eagles may roost communally in single trees or large forest stands of uneven age that have some old-growth forest characteristics (Anthony et. al. 1982). Some bald eagles may remain at their daytime perches through the night but bald eagles often gather at large communal roosts during the evening. Communal night roosting sites are traditionally used year after year and are characterized by more favorable microclimatic conditions. Roost trees are usually the most dominant trees of the site and provide unobstructed views of the surrounding landscape (Anthony et. al. 1982). Roost trees are often in ravines or draws that offer shelter from inclement weather (Hansen et al. 1980; Keister 1987). A communal night roost can consist of two birds together in one tree, or more than 500 in a large stand of trees. Roosts can be located near a river, lake, or seashore and are normally within a few miles of day-use areas but can be located as

far away from water as 17 miles or more. Prey sources may be available in the general vicinity, but close proximity to food is not as critical as the need for shelter that a roost affords (Stalmaster 1987).

Most nesting territories in Washington are located on the San Juan Islands, the Olympic Peninsula coastline, and along the Strait of Juan De Fuca, Puget Sound, Hood Canal, and the Columbia River. In addition, bald eagle nesting territories are found within southwestern Washington, the Cascade mountains, and in the eastern part of the state where adequate sources of prey are available. The nesting season extends from January 1 through August 15, with egg laying in March (Stalmaster 1987). The 1998 information provided by the WDFW indicates that 661 nests were known to be occupied and 1.08 young were produced per active territory in Washington (Stofel, personal communication). This is well above the recovery goal of 276 pairs, and above the recovery criteria of an average of 1.00 young per nest. The 1998 information represents the last year WDFW conducted comprehensive surveys of nesting territories.

Population Dynamics

In the 23 years since it was listed throughout the conterminous 48 States, bald eagle populations have increased in number and expanded their range. The improvement is a direct result of recovery efforts including habitat protection and the banning of DDT and other persistent organochlorines. The species has doubled its breeding population every 6 to 7 years since the late 1970s. As a result, the FWS has reclassified the bald eagle from endangered to threatened in the lower 48 states, and proposed for delisting (FR 64 36454). Of the seven states covered by the Pacific Bald Eagle Recovery Plan, Washington state supports the largest bald eagle breeding and wintering populations (USDI 1986).

Approximately one-half of all wintering bald eagles within the seven state Pacific Recovery Area (Washington, Oregon, California, Montana, Wyoming, Idaho, and Nevada) inhabit Washington and Oregon during the winter. Additionally, more than two-thirds of all nesting bald eagles in this region are found in these two states, with Washington having the highest nesting population. Population viability in these two states plays an important role in sustaining the population in the Pacific Region. On a regional basis, the population of bald eagles in Washington and Oregon has increase during the past 10 years, and most of the recovery goals have been met. The Plan area lands fall into the Washington Coast and Interior Olympic Recovery Zones within the Pacific Recovery Area.

The recent proposal to delist the bald eagle in the lower 48 states (64 FR 36454) indicates that numeric delisting goals have been met for the bald eagle in the Pacific Recovery Region since 1995. The proposed project is located within the Pacific Recovery Region.

Range

As stated, the original federal listing of the bald eagle was due to the decline in the bald eagle population throughout the lower 48 states. The decline was largely attributed to the wide-spread use of dichlorodiphenyltrichloroethane (DDT) and other organochlorine compounds in addition to destruction of habitat, illegal harassment and disturbance, shooting, electrocution from power lines, poisoning, and a declining food base.

The bald eagle formally bred throughout North American, but now breeds only in the Aleutians, Alaska, parts of northern and eastern Canada, northern United States, and Florida.

Habitat loss continues to be a long-term threat to the bald eagle in the Pacific Recovery Area of Washington, Idaho, Nevada, California, Oregon, Montana, and Wyoming. Urban and recreational development, logging, mineral exploration and extraction, and all other forms of human activities are adversely affecting the suitability of breeding, wintering, and foraging areas. While individual and small scale actions may not appear to significantly affect the species as a whole, the cumulative long-term effects throughout this recovery area pose an important threat to the species recovery.

Human disturbance of bald eagles will continue to threaten this species. Disturbance of bald eagles by human activities has been discussed in many studies on wintering bald eagles. Disturbance is expected to increase with human development expanding into rural areas and as numbers of bald eagles increase. Many studies have indicated that bald eagles will flush from the nest site if disturbed by human presence. If the disturbance occurs frequently, nesting can fail, and the adults may abandon the nest (64 FR 36454). Individual birds may react more strongly than others to disturbance, based on potential habituation or lack of it. They appear to be more tolerant of disturbance if they are physically screened. A 300 meter buffer was suggested as an effective zone to reduce disturbance on the Nooksack River (Stalmaster and Newman, 1979).

Analysis of the Species
The recent proposal to delist the bald eagle in the lower 48 states (64 FR 36454) indicates that numeric delisting goals have been met for the bald eagle in the Pacific Recovery Region since 1995.

Bull Trout/Dolly Varden

Taxonomy
Bull trout or bull char are a member of the genus *Salvelinus*, within the Salmonidae family. This family also includes Pacific salmon of the genus *Oncorhynchus*. Bull trout are closely related to Dolly Varden (*Salvelinus malma*) and is sympatric with this species over part of their range, most notably in the Coastal/Puget Sound Region of Washington State. The taxonomic classification between these two char has been fraught with difficulty. Characteristics distinguishing the two species as well as a taxonomic description of bull trout are presented by Haas and McPhail (1991). Char can be easily differentiated from other native pacific salmonids by their white spots on a dark background, whereas the later have dark spots on a light background.

Status
The FWS listed the Columbia River and Klamath Basin Distinct Population Segments (DPSs) of bull trout as threatened under the Act on June 10,1998 (63 FR 31647). The Coastal/Puget Sound and St. Mary-Belly River DPSs of bull trout were listed as threatened under the Act on November 1, 1999 (64 FR 58910). This rule combined all DPSs of bull trout in the conterminous United States, and declared them all as threatened. Declining trends and associated

habitat loss and fragmentation have been documented range wide and several local extirpations have been reported (Bond 1992; Rieman and McIntyre 1993; Donald and Alger 1993; WDFW 1997a).

In Washington, the Dolly Varden occurs in several river drainages with the Coastal-Puget Sound population segment of the bull trout. Because of the close resemblance in appearance between bull trout and Dolly Varden, it is difficult to differentiate between the two species.

Species Description

Bull trout are a member of the char family and are related to Dolly Varden trout *(Salvelinus malma)*. Bull trout are sympatric with Dolly Varden over part of their range, most notably in British Columbia and the Coastal/Puget Sound Region of Washington State.

Char have light-colored spots on a darker background, reversing the dark spots on light background pattern of trout and salmon. Cream to pale yellow spots cover the back, and red or orange spots cover the sides. The fins have white or cream-colored margins.

Habitat/Life History

Two distinct life history forms, migratory (fluvial or adfluvial) and resident, exist throughout the range of the bull trout (Rieman and McIntyre 1993). Bull trout are generally not anadromous (Meehan and Bjornn 1991), although anadromy may have been important in the past (Bond 1992) and is currently known to occur in Puget Sound and Coastal rivers (Kraemer 1994; Mongillo 1993). Dolly Varden is mostly a coastal and anadromous species (Cavender 1978), but resident forms of Dolly Varden are known. Many of the life history forms of bull trout and Dolly Varden overlap, and the fish have the potential to interbreed.

Resident populations are generally found in small headwater streams where they spend their entire lives, whereas migratory populations rear in tributary streams for several years before migrating downstream into a larger river or lake to mature (Rieman and McIntyre 1993). Juvenile and adult bull trout frequently inhabit side channels, stream margins and pools with suitable cover (Sexauer and James 1997).

Bull trout become sexually mature at age 4 to 9 years old (Shepard et al. 1984). They spawn in the fall (August through October) (Shepard et al. 1984; Rieman and McIntyre 1996), typically in cold, low-gradient 1st- to 5th-order tributary streams, over loosely compacted gravel and cobble having groundwater inflow (Shepard et al. 1984; Brown 1992; Rieman and McIntyre 1996; Swanberg 1996; MBTSG 1996). Spawning sites usually occur near cover (Brown 1992). Migratory bull trout frequently begin spawning migrations as early as May and have been known to move upstream as far as 259 kilometers (155 miles) to spawning grounds (Fraley and Shepard 1989). Bull trout spawn in consecutive or alternate years (Shepard et al. 1984; Pratt 1992) and may live more than 13 years. Post-spawning mortality, longevity, and repeat-spawning frequency are not well known (Rieman and McIntyre 1996).

Rieman and McIntyre (1993) state that bull trout appear to have more specific habitat requirements than other salmonids. In general, bull trout need habitat providing cold water,

complex cover, stable substrate with a low percentage of fine sediments, high channel stability, and stream/population connectivity. Because bull trout exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1993), they should not be expected to simultaneously occupy all available habitats (Rieman et al. 1997).

Rieman and McIntyre (1993) state water temperature is consistently recognized by researchers more than any other factor as influencing bull trout distribution. Distribution is thought to be limited by temperatures above 15°C, while optimum incubation and juvenile rearing temperatures are thought to be much lower, 2 to 4°C and 4 to 8°C, respectively (Goetz 1989; Pratt 1992). Water temperature seems to be an important factor in determining survival in the early life history of juvenile bull trout, with cool water temperatures resulting in higher egg survival and faster growth rates for fry and juveniles (Pratt 1992).

Sedimentation is shown to cause negative effects on bull trout, although no thresholds can be set as clear tolerance limits for population maintenance (Rieman and McIntyre 1993). Emergence success of fry appears to be affected by the proportion of sediment in the substrate (Pratt 1992). Rearing densities of juvenile bull trout have been shown to be lower when there are higher percentages of fine sediment in the substrate (Shepard et al. 1984). Young bull trout are closely associated with the stream bed, this association appearing more important to bull trout than for other species (Pratt 1992; Rieman and McIntyre 1993). Due to this close connection to substrate, bed load movements and channel instability can also negatively influence the survival of young bull trout.

Bull trout distribution and abundance is positively correlated with complex forms of cover and with pools (Rieman and McIntyre 1993). Cover with which bull trout are usually associated consists of large or complex woody debris and undercut banks, but may also include coarse substrates (cobble and boulder). Studies conducted with closely related Dolly Varden showed that population density declined with the loss of woody debris after clearcutting or the removal of logging debris from streams (Bryant 1983; Dolloff 1986; Elliott 1986; Murphy et al. 1986).

Population Dynamics

Bull trout distribution has been reduced by an estimated 40 to 60 percent since pre-settlement times, due primarily to local extirpations, habitat degradation, and isolating factors. The remaining distribution of bull trout is highly fragmented. Resident bull trout presently exist as isolated remnant populations in the headwaters of rivers that once supported larger, more fecund migratory forms. These remnant populations have a low likelihood of persistence (Reiman and McIntyre 1993). Many populations and life history forms of bull trout have been extirpated entirely.

Highly migratory, fluvial populations have been eliminated from the largest, most productive river systems across the range. Stream habitat alterations restricting or eliminating bull trout include obstructions to migration, degradation of water quality (especially increasing temperatures and increased amounts of fine sediments), alteration of natural stream flow patterns, and structural modification of stream habitat (such as channelization or removal of cover).

Status and Distribution

The historic range of the bull trout spanned seven states (Alaska, Montana, Idaho, Washington, Oregon, Nevada, and California) and two Canadian Provinces (British Columbia and Alberta) along the Rocky Mountain and Cascade Mountain ranges (Cavender 1978). In the United States, bull trout occur in rivers and tributaries throughout the Columbia Basin in Montana, Idaho, Washington, Oregon, and Nevada, as well as the Klamath Basin in Oregon, and several cross-boundary drainages in extreme southeast Alaska. In California, bull trout were historically found only in the McCloud River, which represented the southernmost extension of the species' range. Bull trout numbers steadily declined after completion of McCloud and Shasta Dams (Rode 1990). The last confirmed report of a bull trout in the McCloud River was in 1975, and the original population is now considered to be extirpated (Rode 1990).

Coastal/Puget Sound DPS

The FWS has identified 34[1] subpopulations of native char (bull trout and/or Dolly Varden) within the Coastal/Puget Sound DPS. These subpopulations were grouped into five analysis areas based on their geographic location: Coastal, Strait of Juan de Fuca, Hood Canal, Puget Sound, and Transboundary. These groupings were made in order to identify trends that may be specific to certain geographic areas. In subpopulations where it is not known if the native char that occur there are bull trout, Dolly Varden or both, they are addressed together as "native char" in this discussion. This does not imply that both exist within a subpopulation when the words "native char" are used, but merely that the subpopulation of char has not been positively identified as bull trout and/or Dolly Varden.

Genetic analysis has been conducted on nine of the 35 (see footnote #1) native char subpopulations. Samples from five of the nine subpopulations were determined to contain only bull trout (Green River, Queets River, Upper Elwha River, Cushman Reservoir and Lower Skagit River). Two were determined to contain only Dolly Varden (Canyon Creek and Upper Sol Duc River). The Upper Quinault River contained both bull trout and Dolly Varden. No samples had evidence of hybridization.

Within the Coastal/Puget Sound DPS, 12 of the 35 (see footnote #1) native char subpopulations are known to contain bull trout based on either genetic or morphometric measurement data. In seven of these 12 subpopulations, Dolly Varden are also believed to be present. In three out of the remaining 23 subpopulations, only Dolly Varden are currently known to be present. It should be noted that in most cases, identification was based on a limited number of samples, so it is possible that bull trout may also occur in the three subpopulations that to date, have only yielded Dolly Varden. The FWS believes that the current identification trend of subpopulations within the Coastal/Puget Sound population segment indicates the high likelihood of bull trout being present in the majority of remaining subpopulations

[1] In the proposed rule to list the bull trout (63 FR 31693), the FWS delineated 35 subpopulations. Upon further review, we revised the total number to 34, when we concluded that the Puyallup River Basin had only two subpopulations as opposed to three. We made this revision in order to be consistent with the defined subpopulation criteria.

The FWS rated a subpopulation as either "strong," "depressed," or "unknown," modified after Rieman et al. (1997). A "strong" subpopulation was defined as having all life history forms that once occurred, abundance that is stable or increasing, and at least 5,000 total fish or 500 adult fish present. A "depressed" subpopulation was defined as having either a major life history form eliminated, abundance that is declining or half of the historic abundance, or less than 5,000 total fish or 500 adults present. The FWS rated a subpopulation's status as "unknown" if insufficient information currently exists to determine whether the status of the subpopulation is either "strong" or "depressed." Within the Coastal/Puget Sound DPS, the FWS rates one of the 35 (see footnote #1) delineated native char subpopulations as "strong", 9 as "depressed," and 25 as "unknown."

WDFW also has a rating system for native char subpopulations. Within the Coastal/Puget Sound DPS, 4 of the 35 (see footnote #1) delineated native char subpopulations are rated as "healthy" by WDFW, and the remaining 31 are of "unknown" status. The 1998 Washington Salmonid Stock Inventory for bull trout and Dolly Varden (WDFW 1998b) states, "The Healthy category covers a wide range of stock performance levels, from consistently robust production to those stocks that may be maintaining sustainable levels without providing any surplus production for directed harvests. In other words, the fact that a stock may be classified as Healthy in the inventory process does not necessarily mean that managers have no current concerns about its production status" (WDFW 1998b).

WDFW (1998b) defines a stock as "unknown,"if sufficient trend information was not available or could not be used to assess stock status." WDFW further states that, "[s]tocks rated as Unknown may be rated as Healthy, Depressed, Critical, or Extinct once more information is available."

Native char subpopulations rated as "healthy" by WDFW are: 1) Queets River; 2) Upper Dungeness River; 3) Cushman Reservoir on the Skokomish River; and, 4) the Lower Skagit River. Currently, all but the Upper Dungeness River subpopulation have been determined to consist of bull trout. The FWS believes that the "healthy" status designation for the Queets River, Cushman Reservoir, and Upper Dungeness River subpopulations is not appropriate. Because of information indicating recent declines in the Cushman Reservoir subpopulation (WDFW 1998b) and the lack of recent information for the Queets River subpopulation (general decline indicated by fish/day seining data between 1977 and 1991, and no trend information for 1991 to 1997) (WDFW 1998b), an "unknown" rating better describes their status. The Upper Dungeness River subpopulation status is "tentatively considered healthy" by WDFW based on a single distributional and abundance survey conducted in 1996 (WDFW 1998b). Although the calculated linear densities for the areas sampled on the Upper Dungeness River appear to indicate that char are relatively numerous, the FWS believes this one year of distributional and abundance information is insufficient to conclude a "healthy" or "strong" status in this subpopulation. The FWS believes that the Upper Dungeness River subpopulation should be rated "unknown" at this time. The FWS believes the Lower Skagit River subpopulation meets the criteria described above for a status rating of "strong."

Canada Lynx

Status

The FWS listed the contiguous United States DPS of the Canada lynx as a threatened species March 24, 2000 (65 FR 16052) under the Endangered Species Act. The Canada lynx is classified as a threatened species by the State of Washington (WDFW 1998a). The lynx is considered a sensitive species by the Regional Forester (R6) of the U.S. Forest Service (USFS).

Population Status

Washington's lynx population is estimated to be between 96 and 191 individuals, with the populations responding largely to the abundance of their primary prey, snowshoe hare (WDW 1993c). In northern regions, where hare populations are strongly cyclical, lynx populations fluctuate widely; this pattern appears to be absent in the southern portion of the lynx's range (including Washington state), where lynx and snowshoe hares exhibit life history characteristics similar to those occurring during hare populations lows further north (Koehler and Aubry 1994).

Threats to Lynx

In this region, Koehler (1990) found high rates of kitten mortality during the snow-free season in north-central Washington, with only one kitten surviving until winter from eight kittens present among three litters in July. When prey is scarce, kitten survival is low (Brand and Keith 1979, Bailey et al. 1986). Primary human-associated threats to lynx populations include the elimination of winter habitat for snowshoe hare and excessive trapping (WDW 1991). Because of the significant economic return for lynx pelts, trapping and hunting during the 1970's and 1980's increased the threat to lynx from over exploitation. The effects of overharvest of lynx during this time period persist today and continues to reduce the recovery of lynx (63. FR 37003). As early as 1942, Elton and Nicholson(1942) recognized that overharvest had the potential to reduce lynx populations to levels where the natural cycles of lynx populations could not occur. The effects of trapping have been shown to be additive to natural mortality, rather than compensatory (taking the place of natural mortality) (Brand and Keith 1979).

Loss of suitable habitat reduces the potential for lynx population growth or recolonization by lynx, further confining lynx to smaller, more isolated and less suitable habitat patches (Weaver 1993). Isolation increases the susceptibility of lynx to human-caused threats, random environmental events, and the effects of genetic bottlenecks (Weaver 1993). Likely the biggest modification to suitable habitat for lynx has been precipitated by fire suppression. Forest fires historically maintained a mosaic of early successional forest, un-burned down woody debris, and late-successional conifer forest that provided ideal habitat for snowshoe hares and lynx (Quinn and Thompson 1987).

Roads are also a threat to lynx populations. Lynx use roads for hunting and travel, which may make them more vulnerable to human-caused mortality (Koehler and Aubry 1994). Roads increase human access into forests and increase the likelihood of lynx encountering people that may result in injuries or death by intentional or unintentional shooting, trapping and vehicle accidents (Koehler and Brittell 1990).

Range

Canada lynx in Washington are typically found at elevations above 3,200 ft (Brittell et al. 1989), and ranges from Canada into northeast and north-central Washington, eastward over the Cascade Crest and through the Okanogan Highlands into northern Idaho (McCord and Cardoza 1990, WDW 1993c, Ruggiero et al. 1994). Recent research has placed this species reliably as far south as the Yakima Indian Reservation, the Blue Mountains, the Oregon Cascades and the southern Cascades of Washington (Thomas, T., Ecologist, U.S. Fish and Wildlife Service, Olympia, Washington, February 17, 1998, pers. comm.). In recent years, lynx have been found on the west side of the Cascade Crest only in the northern part of the North Cascades (Koehler and Aubry 1994). Ruediger and Naney (1994) identified primary and secondary habitat important to conservation of the lynx as part of the Lynx Conservation Strategy for the Western United States. Lynx habitat mapping has been ongoing since the species was listed and major revisions were made in the summer of 2000. Currently, lynx habitat and management areas have been delineated down the crest of the Cascades to Mount Adams and across northern Washington to Idaho (pers. com. Martha Jensen FWS).

Habitat

Little or no empirical data exist regarding the habitat requirements of Canada lynx in mid to low elevations on the west side of the Cascade Crest. Data on habitat use has largely been obtained by research conducted in the boreal forest zone, or further north in the sub-arctic. Most of the narrative discussion below is based on findings from these northerly vegetation types, and it is not clear how applicable it might be to how lynx use habitats found in the Green River Watershed.

Lynx are extremely wide-ranging, with home range size varying from between 7 and 115 square miles, depending on sex, age, season, and prey availability (WDW 1993c). This species typically occurs in very remote areas, using extensive tracts of dense forest that are interspersed with rock outcrops, bogs, and thickets (McCord and Cardoza 1990; Koehler and Aubry 1994). Lynx use a mosaic of forest types from early successional to mature coniferous and deciduous forest, as long as snowshoe hares are present (Koehler and Aubry 1994). Early successional forests where snowshoe hares are plentiful are the habitats that lynx favor for hunting (Koehler and Aubry 1994). Throughout the range of lynx, the key factor in whether stands are suitable as habitat appears to be the density of conifer stems, regardless of the species of conifer (Koehler and Aubry 1994). Den sites for lynx, however, tend to be located in mature forest (less than 150-years) that are at least 5 acres in size; have abundant downed woody material; are undisturbed by humans; are within 3.4 miles of foraging areas; and are adjacent to natural travel corridors such as ridges and riparian areas (Koehler 1990; Koehler and Aubry 1994; WDW 1993c). Forests composed of subalpine fir, Engelmann spruce, western and mountain hemlock, silver fir, and Douglas-fir, particularly in association with lodgepole pine, may be used as habitat depending on the availability of their primary prey, snowshoe hare. Subalpine fir communities are not as common on the west side of the Cascades, where mountain hemlock replaces subalpine fir at upper elevations. Dense regeneration stands composed of the same species may serve as foraging habitat. These vegetation types generally occur in areas with heavy winter snow accumulations.

Landscape connectivity is likely a major factor in lynx distribution. Maintaining connectivity between northern habitat and southern habitat is critical to the long-term persistence of Canada lynx in the United States (Aubry et al. 1999).

Grizzly Bear

Status

The grizzly bear was classified as threatened under provisions of the Act on July 28, 1975 (40 FR 31736). The FWS identified the following as factors establishing the need to list: (1) present or threatened destruction, modification, or curtailment of habitat or range; (2) overutilization for commercial, sporting, scientific, or educational purposes; and (3) other manmade factors affecting its continued existence. Livestock depredation control, habitat deterioration, commercial trapping, unregulated hunting, and protection of human life were leading causes of the decline of grizzly bears (FWS 1993). Grizzly bear populations in the lower 48 States had receded from estimates of over 50,000 to less than 1,000 grizzly bears between 1800 and 1975. Habitat loss, and direct and indirect human-caused mortality is related to their decline in numbers. Two of the six ecosystems identified in the grizzly bear recovery plan (FWS 1993) include areas in Washington, the Northern Cascades and the Selkirks. Almack et al.(1994) estimated the 1991 grizzly bear population in the North Cascades recovery area at less than 50, and perhaps as low as 5 to 20. Wielgus et al. (1994) estimated a density of one bear per 27 mi^2 (71 km^2) for the U.S. portion of the Selkirks Ecosystem and one per 17 mi^2 (43 km^2) for the Canadian portion of the Selkirks Ecosystem.

Range

The grizzly bear was originally distributed in various habitats throughout western North America from Central Mexico to the Arctic Ocean. The current distribution of the grizzly bear south of Canada has been reduced to five, possibly six, ecosystems within four states, which equates to less than 2 percent of its former range. One of the ecosystems where the grizzly still exists is the North Cascades of Washington.

A Grizzly Bear Recovery Plan was approved on January 29, 1982, and a revised plan was completed on September 10, 1993 (FWS 1993). The Grizzly Bear Recovery Plan established six recovery zones with the overall objective to de-list the grizzly bear in each of the zones as bears within each zone achieved recovery targets.

Grizzly bear recovery efforts in the Bitterroots Ecosystem and North Cascades Ecosystem are in the planning stages. In the North Cascades Ecosystem, most of the grizzly bear population occurs north of the Canada - U.S. border, but a few grizzlies persist south of the border. Grizzly bears were eliminated from the Bitterroot Ecosystem decades ago, however suitable habitat occurs. A draft EIS has been released for public comment to address the impacts of reintroducing grizzly bears into the Bitterroot Ecosystem in east central Idaho (FWS 2000). Recovery needs for the grizzly bear are described in the Recovery Plan (FWS 1993), which outlines a series of goals and objectives necessary to provide for conservation and recovery of the

grizzly bear in selected areas of the conterminous 48 States. One of these objectives is to recover grizzly bear populations in all of the ecosystems known to have suitable space and habitat. The Recovery Plan identifies six separate recovery zones or ecosystems: (1) the Yellowstone, (2) the Northern Continental Divide, (3) the Cabinet-Yaak, (4) the Selkirk, (5) the North Cascades, and (6) the Bitterroot. Grizzly bears may be recovered and delisted in each of these recovery zones separately.

The North Cascades Recovery Zone consists of 9,565 square miles in area and extends from the Canadian border in north central Washington south to Interstate 90. It includes all of the North Cascades National Park Service Complex; the Mount Baker-Snoqualmie National Forest and Wenatchee National Forest north of Interstate 90; and the Okanogan National Forest west of the Okanogan River. This recovery zone is contiguous to an area of low grizzly bear density in Canada. Verified grizzly tracks have been documented in the north Cascades, and a 6-year study indicated that sufficient amounts of quality habitat exists to sustain a viable population of grizzly bears in the North Cascades (J. Haas, U.S. Fish and Wildlife Service - Western Washington Office, pers. comm., 1996). For additional information concerning the status and biology of the species, refer to the Grizzly Bear Compendium (LeFranc et al. 1987).

The Recovery Plan identifies three indicators of population status, based on reproduction, numbers, and distribution, to be used as the basis for recovery in each ecosystem: (1) sufficient reproduction to offset the existing levels of human-caused mortality; (2) adequate distribution of breeding animals throughout the area; and (3) a limit on total human-caused mortality. Based on these indicators, three specific parameters have been developed to monitor the status of grizzlies in each ecosystem: (1) the number of unduplicated females with cubs seen annually; (2) the distribution of females with young or family groups throughout the ecosystem; and (3) the annual number of known human-caused mortalities. To facilitate population monitoring and habitat evaluation within each ecosystem, the recovery zones are divided into areas designated as Bear Management Units (BMU). These BMUs, designed to approximate the average home range of a female grizzly (approximately 100 square miles), assist in characterizing grizzly bear numbers and distribution within each ecosystem and in tracking cumulative effects (Christensen and Madel 1982).

Species description

A detailed account of the taxonomy, ecology, and reproductive characteristics of the grizzly bear is presented in the Grizzly Bear Compendium (LeFranc et al. 1987) and the Grizzly Bear Recovery Plan (FWS 1993).

Grizzlies are large, averaging 400-600 lbs for males, and 250-350 lbs for females. Grizzly bears are long-lived (up to 20-30 years in the wild) omnivorous, opportunistic feeders that require foods rich in protein or carbohydrates in excess of maintenance requirements in order to survive seasonal pre-and post-denning requirements. Bears are homeo-hypothermic hibernators, meaning their body temperature drops no more than 5^0 C (approx 10^0F) during winter when deep snow, low food availability, and low ambient air temperatures appear to make winter sleep

essential to bears' survival (Craighead and Craighead 1972a, 1972b). They excavate dens and need secure environments well-covered with a blanket of snow for up to 5 months, generally beginning in fall (September-November) and extending until spring (March-April) (Craighead and Craighead 1972b; Pearson 1975).

Life History

Grizzlies search for energy-rich food appears to be a driving force in their behavior, habitat selection and intra/inter-specific interactions. Grizzlies historically used a wide variety of habitats across North America, from open to forested, temperate through alpine and arctic habitats, once occurring as far south as Mexico. They are highly dependent upon learned food locations within their home ranges. Adequate nutritional quality and quantity are important factors for successful reproduction. Diverse structural stages that support wide varieties of nourishing plants and animals are necessary for meeting the high energy demands of these large animals. They follow phenological vegetative, tuber or fruit development, will seek out concentrated food sources including carrion, live prey (fish, mammals, insects), and are easily attracted to human food sources including gardens, grain, compost, bird seed, livestock, hunter gut piles, bait, and garbage. Bears that lose their natural fear and avoidance of humans, usually as a result of food rewards, become habituated, and may become food-conditioned, both behaviors that increase chances of human-caused mortality as a result of real or perceived defense of property or life actions.

Population Dynamics

Adult bears are individualistic and normally solitary, except females with cubs, or during short breeding relationships. They will tolerate other bears at closer distances when food sources are concentrated, and siblings may associate for several years following weaning (Murie 1944, 1962; Jonkel and Cowan 1971; Craighead 1976; Egbert and Stokes 1976; Glenn et al. 1976; Herrero 1978). Grizzlies have one of the lowest reproductive rates among terrestrial mammals, resulting primarily from the late age at first reproduction, small average litter size, and the long interval between litters. Mating occurs from late May through mid-July. Females in estrus will accept more than one adult male (Hornocker 1962), and can produce cubs from different fathers the same year (Craighead et al.1995). Age of first reproduction and litter size may be nutritionally related (Herrero 1978; Russell et al. 1978). Average age at first reproduction in the lower 48 states for females is 5.5 years, and litter size ranges from 1 to 4 cubs who stay with the mother up to 2 years. Males may reach physiological reproductive age at 4.5, but may not be behaviorally reproductive due to other dominant males preventing mating.

Threats

Natural mortality is known to occur from intra-specific predation, but the degree this occurs in natural populations is not known. Parasites and disease do not appear to be a significant cause of natural mortality (Jonkel and Cowan 1971; Kistchinskii 1972; Mundy and Flook 1973; Rogers and Rogers 1976). As animals highly dependent upon learned habitat, displacement into unknown territory such as subadult dispersal may lead to submarginal nutrition, reduced or curtailed reproduction or greater exposure to adult predatory bears or human food sources which

can lead to human-caused mortality. Starvation and loss in dens during food shortages have been surmised, but have not been documented as a major mortality factor. Natural mortality in rare, relatively secretive animals such as grizzlies can be extremely difficult to document or quantify.

Human-caused mortality has been slightly better quantified, but recent models speculate that reported mortality may be up to 50 percent of actual mortality (McLellen et al. 1999). Between 1800 and 1975, grizzly populations in the lower 48 states have declined drastically. Fur trapping, mining, ranching, and farming pushed westward, altering habitat and directly killing bears. Bears historically were targeted in predator control programs in the 1930's. Predator control was probably responsible for extirpation in many states that no longer support grizzlies. More recent human-caused mortality in Montana includes legal hunting up to 1991, management control actions, defense of life, defense of property, mistaken identity by black bear or other big game hunters, poaching, and malicious killing.

Grizzly bears normally avoid people, possibly as a result of many generations of bear sport hunting and human-caused mortality. Displacement away from human activities has been documented to reduce fitness of bears affecting survival in some instances. Avoidance of roads can lead bears to either avoid essential habitat along roads, or could put them at greater risk of exposure to human-caused mortality if they do not avoid roads.

Marbled Murrelet

Status
The marbled murrelet was federally listed as threatened on September 28, 1992 (57 FR 45328). Critical habitat was designated on May 24, 1996 (61 FR 26256). The marbled murrelet is listed as a threatened species by Washington Department of Fish and Wildlife. The Marbled Murrelet Recovery Plan (FWS 1997a) outlines the conservation strategy for the recovery of the murrelet. As a starting point, and based on conservation needs, the Recovery Team identified six Marbled Murrelet Conservation Zones throughout the listed range of the species. These are the Puget Sound Conservation Zone (Zone 1), the Western Washington Coast Range Conservation Zone (Zone 2), the Oregon Coast Range Conservation Zone (Zone 3), the Siskiyou Coast Range Conservation Zone (Zone 4), the Mendocino Conservation Zone (Zone 5), and the Santa Cruz Mountains Conservation Zone (Zone 6).

The Recovery Plan identified as a primary recovery task the need to delineate and protect areas of habitat within each Zone. Because there will be little opportunity for increases in marbled murrelet productivity as a result of forest maturation in the near future, the Recovery Plan concludes that "any further substantial reduction in occupied habitat would hamper efforts to stabilize the population and eventually recover the species."

Species Description
The marbled murrelet is a small diving seabird that breeds along the Pacific coast of North America from the Aleutian Archipelago and southern Alaska south to central California (USDI 1997).

Habitat/Life History

Marbled murrelets are dependent upon old-growth forests, or forests with an older tree component, for nesting habitat (Hamer and Nelson 1995; Ralph et al. 1995). Sites occupied by marbled murrelets tend to have a higher proportion of mature forest classes than do non-occupied sites (Raphael et al. 1995). Much of this forest habitat has been harvested for human use over the last century (Booth 1991; Bolsinger and Wadell 1993; Ripple 1994; Perry 1995). Based on Teensma et al. (1991) and other sources, Ripple (1994) concluded that the amount of old-growth forest lands in the Oregon Coast Range was 43 percent in 1933 and 61 percent before the 1840's. This determination is consistent with Booth's (1991) conclusion that 82 to 87 percent of the old-growth forests that existed in western Washington and Oregon prior to the 1840s is now gone.

Perry (1995) summarized the amount of potentially suitable marbled murrelet habitat remaining within Washington, Oregon, and California: Washington has approximately 977,811 acres, Oregon has approximately 565,185 acres, and California has approximately 819,472 acres, for a total of 2,362,469 acres. Perry (1995) provided two caveats regarding the interpretation of these data. First, estimates are largely based upon interpretations of satellite imagery and have not been thoroughly ground-truthed. Second, the estimates refer to quantity of potential habitat, not function. Depending on proximity to the coast, landscape context, and size, any stand may or may not provide functional marbled murrelet habitat. He defined functioning habitat as that which meets basic nesting requirements, provides refuge from predators, and is relatively stable against catastrophic disturbances. Perry (1995) concluded that it is not possible at this time to estimate the proportion of remaining habitat that could be considered of high enough function to allow long-term nesting success.

Based on Perry's (1995) analysis and United States Department of Agriculture and United States Department of Interior (1994), the FWS concludes that the actual amount of high functioning nesting habitat available to marbled murrelets in Washington, Oregon, and California is less than the 2,362,469 acres of potentially suitable habitat remaining. The actual amount of habitat could be significantly less, but the FWS currently does not have the information to quantify this figure.

Population Dynamics

The size of the listed population of the marbled murrelet in Washington, Oregon, and California has been estimated at 18,550 - 32,000 (Ralph et al. 1995). The large range in the population estimate is the result of two widely divergent population estimates in Oregon. In Washington, Speich and Wahl (1995) concluded that marbled murrelet populations in Puget Sound are lower now than they were at the beginning of this century. The estimate for Washington, which was made in the early 1980s, is about 5,500 marbled murrelets (Speich and Wahl 1995). Varoujean and Williams (1994) estimated that 1,720 birds occur on the outer coast of Washington and the western portion of the Strait of Juan de Fuca.

Productivity estimates range from 3 percent juveniles in the California population (Ralph and Long 1995) to 8 percent in the Puget Sound population in Washington (Stein and Nysewander, In draft). These estimates are indicative of low productivity. Using these juveniles to adult ratios, Beissinger (1995), and Beissinger and Nur (1997) constructed a demographic model to evaluate

marbled murrelet population trends and concluded that the population may be declining at a rate of 2 to 12 percent per year. It is possible, however, that the age-ratio data used in the model are reflective of unusual adverse ocean conditions (Ralph et al. 1995).

Ralph and others (1995) summarized some of the reasons for variability in population estimates among researchers, including differences in methodology, assumptions, spatial coverage, and survey and model errors. Nevertheless, both Ralph et al. (1995) and the Marbled Murrelet Recovery Team (1994) have concluded that the listed population appears to be in a long-term downward trend. The Recovery Team estimates that the population may be declining at a rate of between 4 to 12 percent, which means that in 20 years the population could be less than one-half to one-twelfth its current size.

Range
The loss of nesting habitat (older forest) has generally been identified as the primary cause of the marbled murrelet's population decline and disappearance across portions of its range (Ralph et al. 1995; USDI 1997). Fragmentation of the remaining older forests may have resulted in increased populations of nest predators, and increased visibility and vulnerability of flying or nesting adults to potential predators. This change in turn has probably led to increased rates of predation on nests and possibly on adults (USDI 1997).

Marbled murrelets may be declining in Washington, Oregon, and California at a rate of 2-12 percent per year (Beissinger 1995; Beissinger and Nur 1997).

Threats to murrelets besides loss of habitat include: poor reproductive success in the habitat that remains; predation; mortality in gillnets; and oil spill mortality. Poor breeding success could be as a result of predation, and/or it could reflect a larger than normal non-breeding adult segment of the population. Potential factors which may also be adversely affecting murrelets include (lack of) prey abundance, and El Niño events.

Analysis of the Species
The listed population of marbled murrelets appears to be in a long-term downward trend. The Recovery Team estimates that the population may be declining at a rate of between 4 to 12 percent, which means that in 20 years the population could be less than one-half to one-twelfth its current size (USDI 1997).

Northern Spotted Owl

The northern spotted owl was listed as a threatened species on June 26, 1990, as a result of declining populations and the loss of suitable habitat from timber harvesting (55 FR 26114). On January 15, 1992 (57 FR 1796), the FWS designated 6,887,000 acres of spotted owl critical habitat, solely on Federal lands. This designation provided additional protection to the species by requiring Federal agencies to consult with the FWS on actions that may affect the primary constituent elements of spotted owl critical habitat.

For a detailed discussion of the biology and status of the spotted owl, refer to following the documents: the 1990 Status Review (FWS 1990a); the final rule listing the spotted owl as threatened (55 FR 26114); the biological opinions for the USFS's Region 6 pre-Section 318 (FWS 1990c) and Section 318 (FWS 1990b) timber sale programs; the final rule designating critical habitat (57 FR 1796); the Interagency Scientific Committee (ISC) report (Thomas et al. 1990); the Scientific Analysis Team report (Thomas et al. 1993); the Forest Ecosystem Management Assessment Team Report (USDA et al. 1993); *Spotted Owl Habitat in Washington: A Report to the Washington Forest Practices Board by the Spotted Owl Scientific Advisory Group* (Hanson et al. 1993); the proposed 4(d) special rule (60 FR 9484); the supporting documents for the Northwest Forest Plan (USDA and USDI 1994a, 1994b); *The contribution of Federal and Non-federal habitat to Persistence of the Northern Spotted Owl on the Olympic Peninsula, Washington: Report of the Reanalysis Team* (Holthausen et al. 1995); the *Demography of the Northern Spotted Owl* (Forsman et al. 1996) and the *analysis of Demographic rates of Northern Spotted Owls* (Forsman and Anthony 1999).

In 1990, the Interagency Scientific Committee (ISC) (Thomas et al. 1990) identified various graphic units termed Habitat Conservation Areas (HCAs) which were intended to support spotted pairs. The HCAs were divided into two categories: Category 1 HCAs included habitats capable of supporting 20 pairs of spotted owls and Category 2 HCAs included habitats capable of supporting 2 to 19 pairs of spotted owls. Within this context, intervening habitat between HCAs was considered for dispersal habitat and connectivity, which resulted in the development of the "50-11-40 rule" (i.e., timber harvesting on Federal lands shall be permitted when at least 50 percent of the forest landscape within a quarter township consists of forest stands with a mean DBH of 11 inches and a canopy closure of 40 percent).

In addition to the HCA units identified by the ISC, physiographic provinces developed by Franklin and Dyrness (1988) provided a recognized set of landscape subdivisions incorporating the physical and environmental factors that shape the landscape of the Pacific Northwest. The provinces identified in the State of Washington were the Washington Cascades East, Olympic Peninsula, Washington Cascades West, and Southwest Washington. These physiographic provinces were modified and used in the ISC as the first subdivision of the range of the spotted owl (Thomas et al. 1990).

These provinces were further subdivided by areas of special concern, where past natural occurrences and human actions have adversely affected habitat more than in the remainder of the province. The areas of special concern consisted of the North Cascades, North Cascades East, Olympic Peninsula, Southwest Washington, and Columbia River in Washington; the Oregon Coast Range and southern Deschutes in Oregon; and, the Shasta-McCloud, North Coastal California and Mendocino National Forest in California (Thomas et al. 1990).

Northwest Forest Plan

The next phase in spotted owl management was the formation of the Forest Ecosystem Management Assessment Team (FEMAT) in 1993. The FEMAT was an interagency, interdisciplinary team of experts that produced a report assessing ten options for management of federal forests within the

range of the spotted owl. This served as the basis for President Clinton's proposed Forest Plan which was announced on July 1, 1993, and analyzed in a Draft Supplemental Environmental Impact Statement (SEIS). The Final SEIS was made available to the public in February 1994 (USDA and USDI 1994a). The Record of Decision and standards and guidelines for habitat management for late successional old-growth forest species issued in April 1994, provide for an integrated reserve system based largely on the protection of habitat within multiple-purpose watersheds. Concepts such as Late-Successional Reserves and Riparian Reserves were incorporated to assure the viability of threatened and at-risk species, as determined by "viability panels" tasked to predict the likelihood of persistence under each option. Adaptive Management Areas were created to test technical and social objectives associated with the overall strategy of ecosystem management. Further, the Northwest Forest Plan allocated more than 24 million acres of federal lands into six designated categories (Congressionally Reserved Areas, Late-Successional Reserves, Adaptive Management Areas, Managed Late-Successional Areas, Administratively Withdrawn Areas, and Riparian Reserves) and the Matrix.

The basic conservation strategy in the Northwest Forest Plan improves upon the measures developed by the ISC (Thomas et al. 1990). The extensive federal forest reserves are intended to support large, reproductively viable spotted owl population clusters throughout the range of the species on federal lands. The system of Late-Successional Reserves (7,430,800 acres) will not only protect habitat currently suitable for spotted owls, but also develop future habitat in large blocks. Through implementation of the Northwest Forest Plan, federal lands are expected to carry the major burden of conservation and recovery of late-successional habitats and associated species, including spotted owls. The expectation is that spotted owl populations will not decline beyond a viable level during the 50 to 150 year critical transition period and will eventually stabilize at a new equilibrium once suitable habitats have regrown within the federal reserves (USDA et al. 1993). Federal reserves are not expected to be fully restored, at 80 percent suitable habitat, for approximately 100 years (USDA and USDI 1994a).

The FEMAT spotted owl viability panel predicted an 83 percent likelihood that habitat conditions would provide for well-distributed, stable populations of spotted owls on federal lands (USDA et al. 1993; USDA and USDI 1994a). The ISC Plan and Northwest Forest Plan noted that non-federal lands have an important role to play in contributing to the conservation of the spotted owl (Thomas et al. 1990; FWS 1992b; USDA and USDI 1994a).

In 1994, the FWS issued a biological opinion on the Forest Plan that assessed the effects of adopting this comprehensive management plan on federal lands. In that opinion we concluded that it would provide for a stable and self-sustaining spotted owl population on federal lands and, on that basis, provide the federal contribution to owl recovery. Since 1994, the FWS has consulted on many actions associated with implementation of the Forest Plan and other federal activities that may affect the spotted owl or its critical habitat. The geographic scale of these consultations varies from individual timber sales or HCPs to multiple actions covering multiple administrative units, depending on the scope of the proposed federal action. In general, the analytical scale of these consultations is based on the reserve/connectivity goals of the Forest Plan and expressed in terms of changes in suitable owl habitat.

Recently, the FWS completed a range-wide baseline evaluation of the spotted owl and its critical habitat based on data from consultations completed from 1994 to present (Service 2001). The range-wide report is based on a year-long effort to better compile and evaluate information reported in all biological opinions involving effects to the owl or its critical habitat that have been issued since 1994. In brief, this evaluation finds that consulted-on effects regarding the removal and downgrading of suitable owl habitat are below the 2.5 percent estimated by the Forest Plan to be removed from federal lands each decade, that not all consulted-on effects have actually occurred on the ground as of this time, that the range-wide effects to critical habitat are minimal, and that HCPs are generally providing demographic support and/or connectivity with Forest Plan lands. The report concludes that consulted-on effects from 1994 to present are consistent with the assumptions for the first decade of Forest Plan implementation as identified in the FWS's 1994 biological opinion on the Forest Plan, and that effects to critical habitat do not impair its ability to contribute to recovery of the owl across its range.

Proposed Species:

Dolly Varden (see bull trout status)

Candidate Species:

Oregon Spotted Frog

Status

The Oregon spotted frog (*Rana pretiosa*) is a federal candidate species. The FWS has been petitioned to list this species, and is in the process of responding to that petition. The Oregon spotted frog is listed as a state endangered species in Washington. The species is considered a sensitive species by the USFS.

Range

Historically, the range of the Oregon spotted frog in Washington State was distributed through the lowlands of the Puget Trough from the Canadian border south to Vancouver, Washington, and east into the southern Washington Cascades (McAllister et al. 1993; McAllister 1995; McAllister and Leonard 1997). It has been estimated that this species has been lost from over 90 percent of its original range (Hayes 1997). Currently, only four populations are known to occur in Washington: two in the south Puget Sound lowlands (Dempsey Creek and Beaver Creek) and two in the south-central Cascade Mountains (Trout Lake and Conboy Lake) (McAllister and Leonard 1997). In Washington, the Oregon spotted frog has been documented historically in eleven localities in Clark, King, Klickitat, Pierce, Skagit, Snohomish, and Thurston Counties (Hayes 1997, McAllister and Leonard 1997). Populations are currently known to occur only in Klickitat, Skamania, and Thurston Counties (Leonard 1997, McAllister and Leonard 1997).

Habitat

The Oregon spotted frog inhabits emergent wetland habitats in forested landscapes, although it is not typically found under forest canopy. Oregon spotted frogs, however, have been found in riparian forests and areas with dense shrub cover (McAllister and Leonard 1997). This species is

not an old-growth forest obligate, but forested areas may represent important refugia from further population losses (Blaustein et al. 1995). Historically, this species was also associated with lakes in the prairie landscape of the Puget Sound lowlands (McAllister and Leonard 1997). Warmwater marsh habitats for the Oregon spotted frog have been found at elevations from sea level to1700 meters (m) (5500 feet (ft)) in a north-south gradient—approximately 300 m (1000 ft) in British Columbia, 1000 m (3000 ft) in Washington, 1200 m (3500 ft) in northern Oregon, and 1700 m (5500 ft) in southern Oregon (Dunlap 1955; McAllister and Leonard 1997; Hayes 1997, 1998).

This is the most aquatic native frog species in the Pacific Northwest and is almost always found in or near a perennial body of water (e.g., spring, pond, lake, sluggish stream). There is probably a relationship with fairly large marshes (approximate minimum size of 9 acres) that can reach suitably warm temperatures and can support a large enough population to persist despite high predation rates (Hayes 1994). Oregon spotted frog habitat includes zones of shallow water and abundant emergent or floating aquatic plants, which are used for basking and escape cover from predators (Leonard et al. 1993; Corkran and Thoms 1996; McAllister and Leonard 1997). Recent research indicates that Oregon spotted frogs have different microhabitat preferences or requirements in the breeding season, the active (summer) season, and for overwintering (Pearl 1999).

Preliminary results of a habitat utilization study at Dempsey Creek in Washington, indicate that adult frogs move to remnant pools in response to reduced water levels from spring to summer. Adults disperse from these pools during increased precipitation in September and October. Oregon spotted frogs stayed within the study area throughout the year. Individuals equipped with radio transmitters stayed within 800 m (2600 ft) of capture locations (Watson et al. 1998). Recaptures of individuals in the Buck Lake, Oregon, population indicated that adult frogs often move less than 100 m (300 ft) between years (Hayes 1998c). Movement data for the Penn Lake, Oregon, population was consistent with other studies suggesting that most adults make relatively small movements during the peak of the active season, but can cover distances upwards of 100 m (300 ft). Movements over the longer distances occurred near the end of the summer active season when adults might be expected to move toward overwintering habitats (Pearl and Bury 2000).

Oregon spotted frogs at Dempsey Creek selected areas of relatively shallow water (10–30 cm (4–12 in.) deep), with less emergent vegetation, but more submergent vegetation than adjacent habitats. They avoided dry, upland areas of pasture grass (Watson et al. 1998). Cook (1984), however, stated that spotted frogs will forage for insects and other invertebrates in adjacent woods and meadows. At Conboy Lake National Wildlife Refuge, modified creeks, irrigation canals, and ditches are used extensively for overwintering and summer habitat (J. Engler, in litt. 1999). In Oregon, Pearl (1999) found that adult Oregon spotted frogs used a wider range of wetland types and may use smaller habitats (less than 1 ha (2.5 ac)) in the nonbreeding season.

Life History

Oregon spotted frogs begin to breed by 3 years of age; males may breed at 1 year, but generally at age 2, and females breed by 3 years of age (McAllister and Leonard 1997). Male Oregon spotted

frogs are not territorial and may gather in large groups of 25 or more individuals at specific locations (Leonard et al. 1993). Breeding occurs in February or March at lower elevations and in late May or early June at higher elevations, and may also vary with latitude (i.e., southern populations may breed earlier than more northern populations) (Leonard et al. 1993). Males and females probably separate soon after egg laying with females returning to fairly solitary lives. Males may stay at the breeding site, possibly for several weeks, until oviposition (egg laying) is completed (McAllister and Leonard 1997). Oregon spotted frogs breed in shallow pools (5–30 cm (2–12 in.) deep) that are near flowing water, or which may be connected to larger bodies of water during seasonally high water or at flood stage. Characteristic vegetation includes grasses, sedges, and rushes, although eggs are laid where the vegetation is low or sparse (McAllister and Leonard 1997).

At Conboy Lake National Wildlife Refuge, typical egg-laying sites include shallow, gradually receding shorelines on benches of seasonal lakes, marshes, bogs, ponds, floating vegetation mats, and wet meadows. All of these sites dry up later in the season (J. Engler, in litt. 1999). Some eggs, however, are deposited along the edges or shallow benches of permanent, human-altered wetlands or irrigation canals and ditches. Although native vegetation is the preferred substrate for egg-laying, Oregon spotted frogs will also use reed canarygrass (*Phalaris arundinacea*) that is mixed with native vegetation and grazed or mowed (J. Engler, in litt. 1999). Because a low pH or an elevated pH can have negative affects on amphibians, the pH of the water should probably be nearly neutral, although specific range tolerances of the Oregon spotted frog are not known (Boyer and Grue 1995; M. Hayes, pers. comm. 2000).

Oregon spotted frogs' eggs are extremely vulnerable due to the species' egg-laying habits. Females may deposit their egg masses at the same locations in successive years, indicating the sites may have unique characteristics (Licht 1971). Use of traditional oviposition sites that may have limited availability because of unique characteristics, and the possibility that adults may have limited flexibility to switch sites, makes the Oregon spotted frog particularly vulnerable to oviposition site modification (Hayes 1994). Egg masses are laid communally in groups of a few to several hundred (Licht 1971; Nussbaum et al. 1983; Cook 1984; Hayes 1997; Engler and Friesz 1998). Eggs are laid in shallow, often temporary, pools of water, which can result in high mortality rates for eggs due to desiccation and/or freezing (Leonard et al. 1993). Oregon spotted frogs experience high mortality rates at all stages of the life cycle (Licht 1974).

Oregon spotted frogs remain in warmwater marshes except during the overwintering period. Recent data indicate that overwintering sites are associated with springs or other locations with low-flow conditions. This choice of overwintering site may reflect selection of microhabitats that do not freeze and have high oxygen levels (Pearl 1999; Pearl and Bury 2000; M. Hayes, pers. comm. 1999). Oregon spotted frogs apparently burrow in mud, silty substrate, or clumps of emergent vegetation when inactive during periods of prolonged or severe cold (Hayes 1994, McAllister and Leonard 1997). This species is generally inactive during the winter, except on warmer days.

Oregon spotted frogs have a number of documented and potential natural predators, including a variety of snake, bird, and mammal species (McAllister and Leonard 1997). Tadpoles may be preyed upon by numerous vertebrate predators including birds, snakes, newts, salamanders, and

fish as well as some invertebrate species, such as beetles and leeches. Predation and competition with a number of non-native fish and bullfrogs, which have been introduced into the historic range of the Oregon spotted frog, have contributed to the decline of this species (Hayes and Jennings 1986, Hayes 1994, McAllister and Leonard 1997).

Population Status
This species was considered conspecific with the Columbia spotted frog (*R. luteiventris*) until very recently, when spotted frog populations in the Columbia River basin were reclassified as Columbia spotted frogs (Green et al. 1997). Limited distribution and isolation of Oregon spotted frog populations have prompted concern for this species' survival (WDFW 1994a). Loss of wetland habitat (e.g., development, dams) and/or alteration of the character of wetlands (e.g., hydrological modifications, introduction of exotic plants such as reed canarygrass, grazing in some circumstances) have been the main reasons for decline of this species (McAllister and Leonard 1997). Other threats to this species include introduction of bullfrogs and predatory fishes and susceptibility to toxic chemicals (WDFW 1994a; Hayes and Jennings 1986).

Other Covered Species:

California Wolverine

Status
The wolverine (*Gulo gulo*) is a federal species of concern in Washington State. The wolverine is a "monitor species" at the state level in Washington.
Wolverines historically occurred at low densities in the Cascades and in northeastern Washington (Johnson and Cassidy 1997). Wolverines declined throughout their range as a result of trapping and habitat loss and modification (Banci 1994). Johnson and Cassidy (1977) suggested that wolverines were present in the Cascade Range of Washington between 1890 and 1919, became absent or rare throughout the state from 1920 through 1959, and then expanded their range in the 1960s and 1970s by dispersal from Canada. There are approximately 20 records for Washington for the period 1983 to 1993 (Maj and Garton 1994). The wolverine's current distribution and abundance in Washington are unknown (Banci 1994), but the population is certainly very low (Johnson and Cassidy 1997).

Range
Wolverines occur across the boreal and tundra zones of Europe and Asia as well as Canada and Alaska (Banci 1994). In the western United States, wolverines occur in Montana, Idaho, Wyoming, Colorado, Washington, Oregon, and California (Banci 1994). In Washington, wolverines historically occurred in the Cascades and in northeastern Washington (Johnson and Cassidy 1997). Maj and Garton present documentation of historic and recent sightings (In Ruggiero et al. 1994) and of the generalized species range (In Butts 1992).

Habitat
Wolverines are wide-ranging animals that inhabit a wide variety of habitats, but are generally associated with boreal forests, tundra, and remote, montane forest areas (Butts 1992). According

to Banci (1994), researchers have generally agreed that wolverine "habitat is probably best defined in terms of adequate year-round food supplies in large, sparsely inhabited wilderness areas, rather than in terms of particular types of topography or plant associations" (Kelsall 1981). Banci (1994) believes this is true at the landscape level, but that stand-level habitat use has not been adequately investigated. In a Montana study, wolverines were relocated most frequently in medium density or scattered mature timber, and showed a preference for Abies forest types (Hornocker and Hash 1981), particularly in the summer. Wolverines tend to avoid clearcuts, although tracks (which showed straight-line movements at a lope or gallop) have been observed crossing clearcuts (Hornocker and Hash 1981).

Limited information is available on natal dens in forested regions (Banci 1994). Natal dens in Montana were most commonly associated with snow-covered tree roots, log jams, or rocks and boulders (Hash 1987). In northern Lapland, most dens were associated with spruce trees; five were holes dug under fallen spruce trees, two were in standing spruce trees, and one was in a decayed, hollow spruce tree (Pulliainen 1968). In Idaho, wolverines were observed to use avalanche debris as natal dens.

Wolverines appear not to tolerate land-use activities that permanently alter habitats, such as agriculture and urban development (Banci 1994). Remaining populations have been relegated to the last available habitat that has not been developed, extensively modified, or accessed by humans (Banci 1994). The presence of humans may conflict directly with wolverines (Banci 1994). Hornocker and Hash (1981) suggested that human access on snowmobiles or all-terrain vehicles in winter and early spring could disturb wolverine behavior.

All studies conducted to date have shown the importance of large mammal carrion as a principal constituent of the wolverine diet (Banci 1994). Banci (1994) states that "the availability of large mammals underlies the distribution, survival and reproductive success of wolverines." Similar findings were made by Van Zyll de Jong (1975) and Hornocker and Hash (1981). Snowshoe hares, porcupines, red squirrels, ground squirrels, and marmots can be important prey items depending on the geographic areas and season (Banci 1994). Allen (1987) recommended a variety of successional stages in a mosaic. Wilson (1982) suggested that the "best way to manage this species is to do nothing". Butts (1992) stated that the key to wolverine management is: (1) The less development, the better. Roads, if necessary should be one way (not loops), as primitive as possible, and permanently closed after activities are completed; (2) Timber harvest should be accomplished in a manner that will provide the greatest biological diversity over the long term. Cuts should be relatively small, not adjacent to large openings, leave some down material and some understory for small birds and mammals, and provide travel corridors between secure cover areas; and (3) Carcasses of big game are an important component of wolverine late-winter diet, especially in areas with long, intense winters (most of wolverine range). Activities that encourage or maintain ungulates and their winter ranges will benefit wolverines.

Population Dynamics and Status

Females do not breed until their second year, and typically have 3-4 young per litter, and do not appear to bear young every year; males are not reproductively mature until age 2 (Banci, 1994 In

Ruggerio, et al. 1994). Range-wide, wolverines are now found in remote, wilderness areas; typically at high elevations at the southern fringe of their range. Across their range, estimates of wolverine age and sex composition have suffered from small sample sizes (Banci, 1994 In Ruggerio, et al. 1994).

Wolverines are thought to have historically occurred at very low densities in the Cascades and northeastern Washington (Johnson and Cassidy 1997). Wolverines are now very rare in Washington State, with confirmed sightings only sporadically (Dvornich et al. 1997). No data on reproduction or population densities are available for Washington state, and evidence of successful reproduction has never been found Johnson and Cassidy 1997).

Cascades Frog

Status
The Cascades frog (*Rana cascadae*) is considered a species of concern by the FWS. This species is not on the WDFW's species of concern list. The Washington Natural Heritage Program list indicates the Cascades frog is apparently secure, with many occurrences in the state (S4), but is a taxa of potential concern (e.g. monitor species).

Since the mid-1970s, populations of this species have experienced marked declines in Oregon and California (ODFW 1996; Blaustein et al. 1995). Blaustein and Wake (1990) estimate 80 percent of 30 populations monitored since the mid-1970s have disappeared at least temporarily. Causes of population declines may include drought conditions, non-native fish introductions, pathogens, habitat loss, and sensitivity to increased levels of ultraviolet radiation (Blaustein et al. 1995). Stream channelization and livestock grazing can affect the availability of suitable hibernacula and cover.

Lehmkuhl, Ruggiero and Hall (1991) compiled a list of species associated with late-successional Douglas-fir forests in the Pacific Northwest and modeled the risk of local extinction for each species from habitat loss or fragmentation. This model was based on frequency of occurrence, abundance, body size, and vagility of various species. The Cascades frog was determined to be a species at moderately high risk (score of 8, where 1 is lowest and 10 is highest).

Range
The Cascades frog are found in the Olympic Mountains of Washington and in the Cascade Mountains of Oregon, Washington, and northern California. This species generally occurs in montane meadows and moist forests at 2,000–6,200 feet in elevation (Leonard et al. 1993; Corkran and Thoms 1996).

Habitat
Cascades frog are highly aquatic and typically are found in relatively small bodies of water, particularly in small pools adjacent to flowing streams in subalpine meadows, rather than large lakes (Leonard et al. 1993). Commonly used habitats include relatively small, unvegetated

potholes, sphagnum bogs and fens, seasonally flooded forested swamps, small lakes and ponds, and marshy areas adjacent to streams; however, Cascade frogs are occasionally found in forests away from water (Nussbaum et al. 1983; Leonard et al. 1993; Blaustein et al. 1995). This species requires shallow, usually temporary, ponds for breeding and permanent ponds or streams with well-vegetated banks for hibernating and foraging during the non-breeding season. Hibernation sites probably include permanent ponds, springs, and streams in subalpine and mountain meadows.

Breeding sites generally occur in shallow, gently sloping margins of pond or lake shores, generally over soft substrates (Blaustein et al. 1995). Standing water must be present for the period of time required for eggs to hatch and tadpoles to transform. Changes in water levels or temperatures in breeding areas may reduce hatching success, tadpole survival, and the quality of streambank vegetation used for cover.

Population Dynamics and Status

Breeding begins as soon as the ice and snow melts in spring, from March to April at mid-elevations and May or June at higher elevations (Leonard et al. 1993). Males call both above and below water, and mating occurs in shallow water during the day. Egg masses containing 300–500 eggs are usually laid on top of each other on barely submerged mosses or other short vegetation in shallow water that is less than 8 inches deep. The egg masses may be partially exposed to the air, making the eggs vulnerable to loss due to drying from changing water levels or freezing temperatures (Nussbaum et al. 1983; Leonard et al. 1993; Blaustein et al. 1995; Corkran and Thoms 1996). Although some tadpoles do not metamorphose until their second summer, many tadpoles metamorphose into froglets in August or September of the first year (Leonard et al. 1993; Corkran and Thoms 1996). Sexual maturity is reached at the end of three years or possibly four, and life expectancy for both sexes is about five years (Slater 1939; Nussbaum et al. 1983).

Although the Cascades frog's association with upland habitats is unknown, dispersal is limited by moisture-temperature conditions (Blaustein et al. 1995). Availability of closed-canopy forest and large woody debris may be a limiting factor in the ability of this species to disperse between potential breeding sites.

Cascade Torrent Salamander

Status

The Cascade torrent salamander (*Rhyacotriton cascadae*) is not recognized by the FWS as a listed species, candidate species, or species of concern in Washington. It is recognized by the State of Washington as a candidate species.

Range

Until 1992, this species was considered to be part of a species complex known as the Olympic salamander, whose range extended from northern California to the Olympic Peninsula. This

complex has now been split into four distinct species. The Cascade torrent salamander occurs along the western slopes of the Cascade Range from northeastern Lane County, Oregon, north to the vicinity of Mount St. Helens (Blaustein et al. 1995). The Washington GAP Analysis Project indicates the Nisqually River as the northern boundary of this species' range (Dvornich et al. 1997).

Habitat

Little has been written specifically about the habitat requirements of the Cascade torrent salamander because of its obscure life history and recent reclassification to species status. Most information comes from studies that did not distinguish among Rhyacotriton species, or that focused on other members of this species group. Much of the following discussion is based on studies of the southern torrent salamander (*Rhyacotriton variegatus*); because these two species were similar enough to be considered conspecific until very recently, the Cascade torrent salamander likely has similar habitat needs.

Small cold streams with water seeping through moss-covered gravel are preferred habitats for torrent salamanders (Blaustein et al. 1995). Their typical haunt is the splash zone, where a thin film of water runs between or under rocks. Seeps running through talus provides ideal habitat (Leonard et al. 1993). Breeding habitat for these species is generally considered to be forested permanent seeps, streams, and waterfalls with rocky substrates and cold temperatures (optimum 46 to 55 F). Foraging occurs in moist areas in or near streams and seeps (Corn and Bury 1991; Leonard et al. 1993; Diller and Wallace 1996; Welsh and Lind 1996).

Welsh and Lind (1996) found that the presence of seep habitat was the single best variable for predicting abundance of the southern torrent salamander in northwestern California. The ecological conditions found in late-successional forests (complex structure, deep litter layer, abundant downed woody debris, and dense herbaceous layer) are assumed to provide the adequate terrestrial and aquatic habitat conditions for torrent salamanders (Bury and Corn 1988; Welsh and Lind 1996). Significantly greater numbers of torrent salamanders have been found in older (greater than 200-years old) forest stands than in younger stands (Welsh and Lind 1996, 1991; Welsh 1990; Corn and Bury 1991). However, undisturbed forests and forests greater than 100-years old are also known to provide habitat for this species (Bury and Corn 1989; Diller and Wallace 1996; Welsh and Lind 1996). The Cascade torrent salamander does not seem to be as closely associated with mid- to late-seral forests as Columbia torrent (*R. kezeri*) and Olympic torrent salamanders (*R. olympicus*) (Dvornich et al. 1997).

Optimum substrate size and proportions to maintain adequate interstitial space used for cover and oviposition by this species consist of at least 68 percent gravel, boulder, and bedrock, and less than 50 percent cobble with gravel, with a low percent sand component (Diller and Wallace 1996; Welsh and Lind 1996). High-gradient stream reaches provide suitable habitat because they are transport areas where finer sediments do not accumulate and gravel and cobble do not become embedded (Diller and Wallace 1996).

Torrent salamanders apparently require fairly low ambient temperatures and high relative humidity. Extremely sensitive to body water loss, or desiccation, they die quickly in a dry environment. Other species of terrestrial salamanders can tolerate body water loss of 29 to 39 percent, but torrent salamanders can tolerate only a 19 percent loss (Nussbaum et al. 1983).

Notably, the torrent salamanders are intolerant to desiccation (Jennings and Hayes 1994). Adults may occasionally be found under objects a few feet from water after heavy rains, but this is unusual (Nussbaum et al. 1983). Adults are highly aquatic, often occurring with the larvae in microhabitats. Torrent salamanders, especially larvae, use the crevices and interstitial spaces among and within rocks and rock surfaces to hide from predators. This microhabitat selection makes them highly sensitive to loss of these cover areas by infiltration of fine sediments.

Population Dynamics and Status

The reproductive biology of the Cascade torrent salamander is virtually unknown, as courtship, behavior, and nests have not been reported. Indirect evidence suggests an extended breeding period that may be nearly year-round. Eggs may be laid at almost any time with the peak egg-laying season being late spring (Leonard et al. 1993). One account purports that apparently most eggs are laid in May (Blaustein et al. 1995). In California, oviposition appears to occur during fall or winter (Jennings and Hayes 1994). One study found females with an average of eight yolked ovarian eggs. Eggs hatch into 5/8 inch larvae after 290 days which, in turn, metamorphose after 4 to 5 years. Maturity is reached at 5 2 to 6 years (Leonard et al. 1993). Populations of this species are threatened by removal of riparian old-growth forests, changes in seep hydrology, and increased deposition of fine sediments in streams, primarily resulting from timber management activities (Corn and Bury 1989; Jennings and Hayes 1994; Diller and Wallace 1996). Large quantities of fine sediments can effectively fill these crevices making them inaccessible to even the smallest larva. Cloudy water from suspended sediment may also hamper hunting of small aquatic invertebrates by torrent salamanders. The apparently long (at least 6 years) sexual maturation period of this species makes populations particularly vulnerable to habitat disturbance (Nussbaum and Tait 1977; Jennings and Hayes 1994).

Coastal Cutthroat Trout

Status

Green River coastal cutthroat trout have been classified as part of the Puget Sound Evolutionary Significant Unit by NMFS (64 FR 16397). At this time the Puget Sound coastal cutthroat trout does not warrant listing under Act, as populations have been relatively stable over the past 10-15 years, although many of these populations are believed to be smaller relative to historic levels (64 FR 16397).

The Southwestern Washington/Columbia River Evolutionary Significant Unit coastal cutthroat trout (*Oncorhynchus clarki clarki*) population is currently proposed for threatened status under the Act.

Species Description

Costal cutthroat trout are members of the *Oncorhynchus* species. Benhke (1997) has proposed 14 extant subspecies of *O. clarki*. Life history strategies of costal cutthroat trout are extremely diversified, perhaps more so than any other Pacific salmonid.

Known range

The distribution of costal cutthroat trout is broader than any other cutthroat trout subspecies (Johnson et al. 1999). It extends from the Eel River in northern California to the Kenai Peninsula in Alaska. It extends eastward from the ocean normally less than 100 km and very rarely up to

160km (Johnson et al. 1999). In Washington, the Cascades appear to limit its eastward distribution.

A coastal cutthroat trout population is present in the Green River, however, little information exists on their status (Grette and Salo 1986). The population inhabiting the Green River appears to be small when compared to other streams in Puget Sound (Grette and Salo 1986). Cutthroat trout fry and juveniles (age 1+) were captured in lateral habitats of the middle Green River during juvenile salmonid surveys conducted in 1998 (R2 1999). However, their numbers and distribution relative to other juvenile salmonids appear to be limited.

Life history

The life history of coastal cutthroat is complex with considerable variation within and between populations. Various life history forms frequently occur in the same streams (Johnson et al. 1999). There is also evidence that life history patterns can change within individual fish over time (Johnson et al. 1999). For practical reasons, Johnson (1999) and others, have identified three general life history forms for costal cutthroat trout: nonmigratory, freshwater migratory, and saltwater migratory.

Non-migratory costal cutthroat trout typically inhabit small streams, often in headwater areas. Fish typically live their entire life within a very small reach of stream. These fish normally do not grow to more than 150mm to 200mm and seldom live more than three years (Trotter 1989).

Freshwater-migratory costal cutthroat trout perform migrations within freshwater only. Several migration strategies have been observed: populations that migrate from large streams to smaller ones to spawn (fluvial-adfluvial); fish that reside in lakes the majority of the time but migrate upstream to spawn (lacustrine-adfluvial); and fish that live in lakes the majority of the time but migrate downstream to spawn in the lake outlet (lacustrine) (Johnson et al. 1999).

Saltwater-migratory coastal cutthroat trout migrate from freshwater natal areas to marine waters. Fish smolt in the spring at age 2 and migrate to protected near shore waters. At age 3 or 4 they migrate to the open ocean (Trotter 1989). The fish then return in the fall or winter to feed, seek refuge, or spawn (Johnson et al. 1999).

Coastal cutthroat trout of the Green River exhibit early life history characteristics similar to coho and steelhead whereby juveniles spend time rearing in freshwater before outmigrating as smolts (Leider 1997). While little information exists on Green River cutthroat, Puget Sound cutthroat emigrate to estuaries at a younger age (age 2) and smaller size (6 inches TL) than cutthroat that are exposed to coastal waters (age 3 to 5, 8-10 inches TL) (Johnston 1982). Puget Sound cutthroat trout will feed and migrate along beaches, often in waters less than 10 feet deep (Johnston 1982). Many stocks are thought to stay within estuarine habitats for their entire marine life (Leider 1997). Most cutthroat return to freshwater the same year they migrate to sea.

Adult cutthroat trout in Washington tend to follow two run-timings (Johnston 1982). Early returning cutthroat trout typically peak in large streams in September and October. Late-returning cutthroat trout peak in December and January in small streams draining directly to salt water. Grette and Salo (1986) noted that adult upstream migration in the Green River occurs

from July through early February, peaking in October and November (Grette and Salo 1986). For the purpose of this document, Green River cutthroat will be considered early returning.

The spawning period for anadromous cutthroat trout ranges from December to June (Trotter 1989). Coastal cutthroat trout spawn in low gradient reaches of small tributaries, or in the lower regions of streams (Trotter 1997). This appears to be an adaptation to isolate their nursery/rearing ground from other, more competitive, species such as steelhead (Stolz and Schnell 1991). The preferred spawning substrate is pea to walnut sized gravel, in 6-18 inches of water, with pools nearby for escape cover. Actual spawning may extend over a period of 2 to 3 days (Trotter 1997). Cutthroat eggs require approximately 300 temperature units for incubation, and an additional 150 to 200 units for emergence to occur (Stolz and Schnell 1991). One temperature unit is defined as one degree above zero for one day.

Emergence of juvenile cutthroat occurs from March to mid-July, depending on spawning date and water temperature (Trotter 1997). Newly-emerged cutthroat trout are very small (<1.0 inch TL). Juvenile cutthroat move immediately to low-velocity lateral habitats where they rear for two or more years, seeking pools and other slow water habitats with root wads and large wood for cover (Trotter 1997). Often coho fry are present in the same habitat, and the larger coho will drive the cutthroat into riffles, where they will remain until fall and winter (Sabo 1995). Seaward migration of cutthroat smolts peaks in mid-May at 2, 3, or 4 years of age (Trotter 1997). Average length at this time was found to be 6 inches total length (Johnston 1978). During the marine phase of their life cycle, juvenile and adult coastal cutthroat trout appear to utilize waters near the shore, usually in areas relatively near their natal streams (Moyle 1976; Johnston 1982; Trotter 1997). Both gravel beaches with upland vegetation, and nearshore areas containing large logs and other large woody debris are used during the marine residency phase.

Like steelhead, adult coastal cutthroat trout are repeat spawners, but unlike steelhead, coastal cutthroat trout recover quickly to pre-spawn condition (Trotter 1997). They may live to an age of 7 or 8 years, spawning three, four, or even as many as five times during their life (Trotter 1997) Costal cutthroat trout generally remain inshore or in areas of reduced salinity while in salt water and will rarely, if ever, overwinter in saltwater; some of the returning fish may not spawn during their first or second migrations back into freshwater (Behnke 1997; Trotter 1997). Spawning fish home precisely to specific tributaries while non-maturing fish do not always return to their home stream to feed or when seeking an over winter habitat (Johnston 1981). Coastal cutthroat trout are usually smaller than other anadromous salmonids, and rarely exceed 20 inches TL. This size appears to be adaptive for entering small tributaries where interspecific competition for habitat with other, larger, salmonids are reduced (Pearcy 1997).

Common Loon

The common loon (*Gavia immer*) is one of five species of loons, very specialized diving birds that belong to the small, closely related taxonomic family Gaviidae. As a result of a suspected decline resulting from human activities in Washington, the common loon has been designated as a state candidate species, under consideration for listing as either a threatened or an endangered species.

Range

The geographic distribution of loons is Holarctic (without tropical species)(McIntyre 1988). The range of the common loon, a migratory species, extends throughout Canada, Alaska and the northern United States, and a much smaller population winters along the European Coast and breeds in Iceland and Greenland (McIntyre 1988). The North American populations breed on freshwater lakes throughout Canada, most of Alaska (except the high Arctic), and the northern tier of the lower 48 United States (WDW 1991; McIntyre 1988). The North American populations winter along the Pacific coast from Alaska to northern Mexico, and along the Atlantic coast from Newfoundland to northern Mexico.

Substantial numbers of birds, including an unknown number of non-reproductive adults and subadults, are present temporarily on many lakes throughout sections of western Washington and the Puget Sound Region during both spring and fall migrations. However, few of these wintering and migrating loons remain in the region during the summer breeding season (WDW 1991). As a result, breeding populations in Washington state are present, but in low numbers.

The Pacific Northwest, and particularly the Puget Sound region of Washington, is located at the western and southern edges of the documented breeding range of the common loon. Historic densities of breeding loons in this region may never have been as high as the densities currently found in more central areas of the species' breeding range, particularly in Canada, Alaska, north-central United States, or in some northeastern states. However, because of the impact that human disturbance has on loons, it is quite possible that the breeding population of this region was higher than it is today and that it has declined in recent decades.

Several types of human activity may have contributed, either directly or indirectly, to the suspected decline in the common loon breeding population in Washington state. The rising popularity of recreational boating activities on lakes that have or might have supported nesting loons may have been a major influencing factor. These activities are thought to be responsible for a dramatic increase in egg predation, which occurs after incubating loons are frightened off the nest by boats (WDW 1991). The species is also vulnerable to other human activities such as logging, road construction and traffic, development of shoreline, camping, removal of large wood from lakes, and fluctuation of water levels such as occurs in reservoir systems (Vermeer 1973; Ream 1976). Finally, another human-related environmental factor that has contributed to the decline of loon population numbers in other areas is acid rain (Ream 1976). In areas where acid rain is a problem, loons successfully hatch eggs, but the chicks or young loons starve to death because of a lack of forage fish caused by acidification of lakes.

Life History

Common loons are relatively long-lived birds that may live 25-30 years. They appear to return to the same breeding areas in successive years throughout their lives (McIntyre 1988). The annual reproductive cycle usually begins in early spring when adult males leave marine wintering areas and migrate inland to breeding territories on freshwater lakes. Pair bonding occurs soon after both members are present and territories are established quickly. Pair-bonding, mating, and egg laying in the Pacific Northwest region typically occurs between April 1 and May 15.

Individual loons have been observed to exhibit strong fidelity to nest sites and territories, occupying the same nest sites and utilizing the same territories for many years. Until recently it had been assumed that pairs were monogamous within the breeding season and over their full life span. However, recent evidence suggest that although pair-bonds are maintained within a breeding season, pair membership may change in successive seasons, and then, in some cases, be reestablished.

Mated pairs typically occupy their established breeding territory throughout the summer until just prior to fall migration. However, individual pair members may leave territories periodically during the summer on a temporary basis, move to other lakes, and then return, even if chicks are present. This type of shift in habitat use may be related to available food supply within breeding territories and nursery areas (McIntyre 1988).

Loons prefer to nest on small islands within lakes and ponds rather than on perimeter shoreline (WDW 1991; McIntyre 1988; Titus and Van Druff 1981; Ream 1976; Vermeer 1973). Because loons' walking ability is very poor, nests are usually located at the water's edge or within 4.5 ft of shore (Vermeer 1973). Nests are constructed from a wide range of terrestrial and aquatic plant materials (McIntyre 1988), but may also include other types of materials such as sticks, and in some cases, stones. If nest material is not available, eggs may be placed on bare substrate. Ideally, the nest floats or is adjacent to water deep enough to permit underwater approach and departure by the adults (Ehrlich et al. 1988). Common loons also nest on emergent aquatic vegetation at the edge of shallow water, and are known to successfully use artificial nesting platforms in some areas (McIntyre 1988; McIntyre and Mathisen 1977).

As mentioned above, common loons typically establish nest sites at the waterline to provide both easy and covert access to the nest from the water and immediate escape from the nest to water when threatened (McIntyre 1988). Nests may consist of a minimal amount of material deposited on a relatively flat surface or be of more substantial size, constructed of materials such as sticks, vegetation, and aquatic plants, and attached to a shoreline structure or emergent vegetation (McIntyre 1988). Nests established in either of these ways are relatively secure under most conditions in natural systems, but because of their waterline locations, are always susceptible to any changes in water levels. Relatively small increases in water levels can inundate nests, tilt them, or break them free and cause the nests to float away, resulting in loss of eggs or nest abandonment. Conversely, decreasing water levels may prevent adults from accessing established nest sites in certain situations because of the awkwardness of loons on land (McIntyre 1988; Leahy 1982). Decreasing water levels may also prevent newly hatched chicks from reaching water and thus expose them to abandonment or excessive threat from predators. During the nesting season, loons are capable of behaviorally compensating for small changes in water levels by adding material to nests to keep eggs above water, or in rare cases traversing dewatered substrates to access nests. On most natural bodies of water, changes in water levels tend to be gradual and of relatively small magnitude. However, in many regulated systems such as reservoirs, operational constraints imposed by water supply, flood control demands, and unpredictable environmental conditions produce both rapid and dramatic fluctuations in surface elevations. Such fluctuations can create adverse conditions for nesting loons.

Population Status

Several nest sites have been confirmed on at least five different lakes in King County during the last decade. Nest sites have also been confirmed in five other counties in the state, including several counties in eastern Washington (WDW 1991). However, a majority of common loon nest sites in Washington are located west of the Cascade Mountains. In addition, not all of the sites identified have been confirmed active or have been reproductively successful in all years during the decade. Significantly, only 10 or 12 common loon breeding sites are currently known to have been active at any time during the 10-year period in Washington state.

Common loon females typically lay from one to three large, brown eggs per season, but four-egg clutches have been observed on rare occasions (McIntyre 1988). A clutch size of two eggs is the most common. Pairs do renest and deposit additional eggs, especially if initial nest sites are disturbed or eggs are lost early in incubation, but subsequent clutches may not contain more than a single egg. Both pair members alternately incubate eggs over a period of time that is approximately 26-31 days in duration. Nests are normally occupied by an adult more than 99 percent of the time (McIntyre 1988).

Chicks are usually coaxed from the nest onto open water by offers of small food items and communication calls within a few hours of hatching, but may return and leave the nest several times if hatching of a second egg is delayed. If hatching is synchronized, the chance of more than one chick surviving is significantly increased. Mated pairs are not known to raise more than one brood in a single breeding season (Ehrlich et al. 1988). Once all viable chicks have been taken from the nest, they move to an open water nursery pool where the chicks are alternately carried on the backs of adults (up to 65 percent of their first week) or encouraged to swim on their own. In the nursery area, both adults feed the chicks small aquatic invertebrates at first, but gradually shift the diet to small fish as the chicks develop.

A suitable nest site is important during the egg-laying and incubation period, but a suitable nursery pool is also necessary to ensure chick survival (Ehrlich et al. 1988). The water in the nursery should be clear enough for the birds to spot their prey, shallow enough to limit the size of predatory fishes and turtles, and reasonably free of predatory eagles and gulls, and it should be rich enough to furnish an 11-week supply of food for two chicks. The nursery pool should also provide a good view of neighboring territories and should be protected from wind and wave action that could separate the adults from the chicks as they swim from nest to nursery. An adequate food supply of larger fish and aquatic invertebrates must also be available for adults either in the nursery area or within accessible distance during the remainder of the summer season prior to fall migration.

Larch Mountain Salamander

Status

The Larch Mountain salamander (*Plethodon larselli*) is a federal species of concern and a sensitive species at the state level in Washington. The species is also considered a Survey and Manage and a Protection Buffer species in the Northwest Forest Plan (USDA and USDI 1994) and a sensitive species by the USFS.

Known populations of the Larch Mountain salamander are somewhat isolated, separated by large expanses of unsuitable habitat. The limited distribution, specialized habitat requirements, and low genetic diversity of this species suggest that populations may be declining (Herrington and Larsen 1985), though recent work by Crisafulli suggests that although patchily distributed, Larch Mountain salamanders may be locally abundant (Charlie Crissafuli, Research Biologist, USFS, pers.comm with Kathleen Cushman, biologist, FWS; 12/98). Nearly one hundred sites are now known from western Washington. The ability of Larch Mountain salamanders to colonize new, unoccupied habitat is unknown. Thus, the future of this species depends upon protection of existing occupied habitat.

Removal of late successional habitat and destruction of talus fields by road construction, timber harvest, and gravel mining and development, are the primary threats to the Larch Mountain salamander (WDW 1993a). Lehmkuhl, Ruggiero, and Hall (1991) compiled a list of species associated with late-successional Douglas-fir forests in the Pacific Northwest and modeled the risk of local extinction for each species from habitat loss or fragmentation. This model was based on frequency of occurrence, abundance, body size, and vagility of various species. The Larch Mountain salamander was determined to be a species at high risk (score of 9, where 1 is lowest and 10 is highest).

Range

Until recently, the Larch Mountain salamander was thought to be endemic to a narrow region where the Columbia River cuts through the Cascade Mountains between Washington and Oregon (Herrington and Larsen 1987). More recently however, populations of this species have been documented as far north Kachess Lake, Kittitas County (Darda 1995; Foster Wheeler Environmental field survey data, 1999), and from the Green River Watershed (Foster Wheeler Environmental field survey data, 1998).

Habitat

In the Columbia River Gorge area, suitable habitat for this species generally consists of forested and non-forested talus areas (Olson 1996). Such areas can occur on or near steep (greater than 40 percent) slopes, and in sites with sparse understories and high litter. Suitable habitat for the Larch Mountain salamander in the Washington Cascade range generally consists of forested talus or boulder fields, cave entrances (basalt tubes), and mature and old-growth forest. Individuals may also occur under exfoliated bark of large Douglas-fir snags and on steep (greater than 40 percent) slopes (Olson 1996). Notably, at two sites found in 1997 on the Mt. Baker-Snoqualmie National Forest, Larch Mountain salamanders were associated with Douglas-fir/western hemlock immature forest and rocky substrates, and one was found on a relatively flat slope. Two other sites also found in 1997 were on the Wenatchee National Forest in the Cle Elum Ranger District. On these sites, Larch Mountain salamanders were associated with fairly open talus (less than 30 percent canopy cover) near mature or old-growth forest.

Northern Goshawk

On September 29, 1997 the FWS announced a 90-day finding (62 FR 50892) in response to a petition from the public to list northern goshawks (*Accipiter gentilis*) west of the 100th meridian. In June of 1998 the FWS completed it's status review (*Northern Goshawk Status Review*, FWS-DOI), and a 12-month administrative finding in response to the petition to list northern goshawks (memo from Regional Director dated June 10, 1998 and *Northern Goshawk Finding*, FWS-DOI). These documents summarize the status of northern goshawks west of the 100th meridian, and describe the threats facing the species; the reader is encouraged to consult these documents for further information if needed. On June 29, 1998, the FWS published in the Federal Register the Notice of 12-month Petition Finding (63 FR 35183).

Northwestern Pond Turtle

Status

The northwestern pond turtle (*Clemmys marmorata*), is a federal species of concern. In Washington, WDFW listed the northwestern pond turtle as a sensitive species in 1981 and as a state endangered species in 1983. The FWS was petitioned in 1992 to list the northwestern pond turtle, but since the species still occurred in 90% of its original range and it was estimated that it was not likely to become extinct in the foreseeable future, the FWS determined that a listing was not warranted at that time. Region 5 and 6 of the USFS have listed the northwestern pond turtle as sensitive (Hayes, et al.1999).

Range

The range of the northwestern pond turtle extends from the Puget Sound lowlands in Washington south to the Sierra San Pedros Martirs in Baja California Norte (Hays et al. 1999). Most populations occur west of the Sierra-Cascade Crest. Documented observations of northwestern pond turtles in Washington appear to be clustered around the southeastern edge of Puget Sound and along a small portion of the Columbia River (Nussbaum et al. 1983; WDW 1993b). Populations are confirmed only in Klickitat and Skamania counties, with recent individual sightings documented in Pierce and King counties (WDW 1993b). Historical records also exist in Clark and Thurston counties (WDW 1993b).

Habitat

The northwestern pond turtle forages in marshes, sloughs, moderately deep ponds, and slow-moving portions of creeks and rivers usually associated with emergent vegetation. Resting habitat includes emergent basking sites such as partially submerged logs, vegetation mats, rocks, and mud banks (Nussbaum et al. 1983). Evenden (1948) reported two records of pond turtles occurring in rapid-flowing, clear, cold, rock and gravel streams in the Cascade foothills. Pond turtles hibernate in bottom mud of streams or ponds, or on land up to 1,600 ft from water (Ernst and Barbour 1972; Holland 1989; Slavens 1992). Uplands adjacent to water bodies are utilized by turtles for dispersal, to nest, overwinter, and to aestivate (Hays et al. 1999). Northwestern pond turtles are found from sea level to 4500 feet, but all records in Washington are below 975 feet in elevation.

Breeding habitat for this species is primarily located near the margin of a pond or stream, but northwestern pond turtles have also been found hundreds of feet from water (Stebbins 1954; Nussbaum et al. 1983). They are known to utilize meadows as well as young seral stages of most forest types including hardwoods, mixed hardwoods, and conifer forests. Average home ranges in California for adult males, adult females, and juveniles are 2.47, 0.62, and 1 acres, respectively (Holland and Bury 1998). Based on preliminary information from the Columbia Gorge population, home ranges in Washington maybe larger (Hays et al. 1999).

Population Dynamics and Status

Only about 250 to 300 northwestern pond turtles are known to remain in the wild in Washington with the majority of these residing in the Columbia Gorge (Hays et al. 1999). A total of 26 individuals were released at the Puget Sound reintroduction site near Lakewood, Washington. Two adult males were also released into wetlands at Northwest Trek in 1996. Other than maybe a few scattered individuals, it is thought that wild populations of the northwestern pond turtle have been effectively extirpated from the Puget Sound lowlands, since no breeding population of wild turtles has been located since the early 1980's (Hays et al. 1999).

In Washington, sexual maturity is thought to be reached at 10 to 12 years for male turtles and 14 to 17 years for females. Females are known to deposit eggs in alternate years, in successive years, or even double clutch is some years (Holland and Bury 1998, Hays et al. 1999). Mean clutch size ranges from 2 to 13 eggs and the mean for 36 wild nests studied in Washington was 6.64 eggs (Hays et al. 1999). Mortality is thought to be high in younger age classes, then even out as turtles approach sexual maturity (Hays et al. 1999). The northwestern pond turtle is declining in numbers throughout its range and it is now only common to a fraction of its original range (Holland and Bury 1994, Hays et al. 1999). Declines in populations of northwestern pond turtles can be attributed to predation form various fish, avian and mammalian species; introduction of exotic species such as bullfrogs and largemouth bass; intentional or accidental killing of individuals by humans; the loss of suitable habitat; severe drought; and disease and parasites.

Olive-sided Flycatcher

Status

The olive-sided flycatcher (*Contopus borealis*) is a federal species of concern in Washington. The olive-sided flycatcher is not listed as an endangered species, threatened species, or candidate species in Washington state.

Range

The olive-sided flycatcher breeds from Alaska east through much of Canada to the Great Lakes region and the northeastern United States, and southward through the mountains of the Pacific Northwest, the Rocky Mountains, and the mountains of California. The species winters in montane Central and South America from southern Mexico through Colombia and Venezuela, south to Peru (Ehrlich et al. 1988). The olive-sided flycatcher occurs in virtually all forested areas of Washington state (Smith et al. 1997).

Habitat
The olive-sided flycatcher inhabits primarily mature forest, old-growth forest, and wet conifer forest, especially those forests with an abundance of snags (Ehrlich et al. 1988; Sharp 1992). These flycatchers were found to occur in relatively similar abundance in young, mature, and old-growth forest stands in the southern Washington Cascades (Carey et al. 1991; Gilbert and Allwine 1991; Manuwal 1991; Ruggiero et al. 1991). This species may also use mixed woodlands near edges and clearings. Smith et al. (1997) consider the olive-sided flycatcher an edge species that occurs throughout forested areas where forest stands are adjacent to open areas, such as clear-cuts, burns, montane meadows, and western Washington agricultural areas.

Nests are often located high in conifer trees, usually on a horizontal branch far from the trunk. Olive-sided flycatchers typically forage by sallying for flying insects from prominent, high hunting perches (live trees or snags) with a view of openings (Ehrlich et al. 1988; Sharp 1992).

Population dynamics and status
Based on data from the North American Breeding Bird Surveys, the olive-sided flycatcher has apparently been in significant decline throughout much of the western United States and across its boreal North American range as well (DeSante and George 1994; Hejl 1994; Peterjohn et al. 1994).

Pacific Fisher

Status
The Pacific fisher (*Martes pennanti pacifica*) is currently a federal species of concern. The FWS was petitioned to list two populations of the fisher in the western United States in December 1994. In the March 1, 1996, Federal Register (61 FR 8016), the FWS presented its conclusion that there was not substantial information indicating that the listing was warranted. In 1991, the FWS declined to list the Pacific subspecies of fisher due to lack of information. In that finding (56 FR 1159), the FWS determined that the fisher in Washington, Oregon, and California represented a population that should be monitored. The fisher is a listed species (endangered) at the state level in Washington.

Population Status
Fishers historically occurred at low densities throughout most of the forested areas of Washington (Stinson and Lewis 1998). The fisher was over-trapped in Washington in the 1800s and early 1900s, leading to population declines. Predator-control programs, possibly in synergy with habitat loss and alteration (i.e., timber harvest), nearly caused the extirpation of the fisher in Washington early in the 1900s (Stinson and Lewis 1998). The fisher has been protected from legal harvest in Washington since 1933, but populations have not recovered.

Currently, the fisher is very rare, and may even be extirpated in Washington (Stinson and Lewis 1998). Therefore, habitat information presented below is based on research conducted in areas other than western Washington (e.g. Rocky Mtns. and New England), and could be considered speculative. Infrequent sighting reports and incidental captures indicate that a small number may still be present, but no one has been able to document the existence of a viable population in the

state (Stinson and Lewis 1998). The lack of fisher detections despite extensive carnivore surveys since 1990, an average of less than four fisher sightings per year since 1980, and very few incidental captures by trappers all indicate that fishers are very rare in Washington and could be extirpated without intensive management efforts (Stinson and Lewis 1998).

Range

The present range of the fisher includes much of the forested region of Canada, New England, northern New York, and northern portions of Michigan, Minnesota, and Wisconsin. Historically, the fisher occurred as far south as Tennessee and North Carolina in the Appalachian Mountains. In the western United States, the fisher occurs in the northern Rocky Mountains, and in the Cascades, Coast Ranges, and Sierra Nevada of Washington, Oregon, and California (Stinson and Lewis 1998).

On the basis of Aubry and Houston's (1992) review of fisher records and sighting reports in Washington from 1985-1991, the fisher is currently believed to occur in the Cascades (north of Skamania County), in the Olympic Mountains, and in eastern Washington in portions of the Okanogan Highlands. It probably occurs in very low numbers and in a patchy distribution (Aubry and Houston 1992). According to Aubrey and Houston (1992), the fisher apparently is no longer found in the Blue Mountains, southern Coast Range, southernmost Cascades, Kitsap Peninsula, and eastern edge of Puget Sound. A comparison of historic and recent sightings is presented by Maj and Garton (In Ruggiero et al. 1994), and includes recent sightings in the Puget Basin. West of the Cascade crest, all trapping records of this species are from locations below 5,400 ft elevation and most (87 percent) are from locations below 3,000 ft (Aubry and Houston 1992).

Habitat

Fishers typically use forests with high amounts of canopy closure, abundant large woody debris, large snags and cavity trees, and understory vegetation (Buck et al. 1983; Arthur and Krohn 1989; Jones 1991; Powell 1993; Seglund 1995). However, no habitat-use research on fishers has been conducted in western Washington or northwestern Oregon, therefore, the following habitat information could be considered speculative. Fishers also typically use a wide variety of vegetation types, including mixed conifer, western hemlock, Pacific silver fir, Sitka spruce, grand fir/Douglas-fir, subalpine fir, and lodgepole pine forests; riparian zones; and swamps (Brown 1985; Aubry and Houston 1992). Riparian areas, cliffs, ridgelines, and lake shores, located in and adjacent to forests, are used by fishers for foraging and as travel corridors (Buck et al. 1983). Buck et al. (1983), Jones and Garton (1994), and Seglund (1995) have shown the importance of riparian habitats for fishers, especially as travel corridors and rest sites (Stinson and Lewis 1998).

Good quality fisher habitat appears to be very diverse, including multi-aged stands interspersed with small openings and containing wetland and riparian habitats that help support a diverse prey base (Banci 1989). Mature and old-growth forests and forested riparian areas with high amounts of canopy closure (at least 80 percent) seem to provide the most suitable habitat for this species, although younger forest and second-growth can be used if sufficient cover is present (Buck et al. 1983; Jones 1991; Roy 1991; ODFW 1992; Jones and Garton 1994; Weir 1995). Stand age may not be as important as stand structural characteristics, such as large trees, snags, large woody

debris, that provide foraging, resting, and denning sites for fishers and also affect snow depth and density (Buskirk and Powell 1982; Powell and Zielinski 1994).

Fishers use a variety of structures in live trees and snags as rest sites, including cavities, witches' brooms, mistletoe clumps, large lateral branches, squirrel and woodrat nests, stick nests and forks (Stinson and Lewis 1998). Large diameter trees are used most often (Buck 1982; Seglund 1995; Weir 1995; Zielinski et al. 1997a). Fishers will also use hollow logs, stumps, log and brush piles, burrows, rock outcrops, and dense understory vegetation as rest sites (Stinson and Lewis 1998). Fishers appear to select rest sites based on thermal cover requirements; cavities and ground dens appear to be used more often in winter than are the more open live tree sites (Seglund 1995).

Female fishers typically use elevated cavities in live trees or snags as natal dens (Buck et al. 1983; Weir 1995; Aubry et al. 1996). This is particularly true when openings are small enough to exclude adult male fishers and other potential predators. Maternal den trees are typically large (Stinson and Lewis 1998). When the young are older, the female may move them to a maternal den in a hollow, down log (Aubry et al. 1996). These conditions are usually found in forests greater than 80-years old. Holthausen et al. (1994) speculated that this specialized requirement for natal and maternal dens may have contributed to the fisher's decline in the Northwest as old-growth forests were cut and converted to even-age stands.

Allen (1983) estimated that at least 100 square miles of suitable, contiguous habitat with 80 percent tree canopy coverage is necessary for a population of fishers. Fisher home range sizes vary widely by region, but male home ranges in the Northwest typically are 15 to 31 square miles, while female home ranges are 8 to 15 square miles (Stinson and Lewis 1998). The fisher is characterized as a species that avoids humans (Douglas and Strickland 1987; Powell 1993). The fisher's diet generally consists of snowshoe hares, small mammals, squirrels, porcupines, birds, and ungulate carrion (Stinson and Lewis 1998). Fishers are generalized predators, and snowshoe hares are considered an important food item.

The primary determinants of sustainable fisher habitat appear to be low-elevation forests containing sufficient structure and prey, with little to no trapping pressure.

Pacific Lamprey

Status
Pacific lamprey (*Lampetra tridentatus*) is listed as a federal species of concern in Washington. Pacific lamprey has no designated state listing status in Washington.

Species Description
Pacific lamprey is a member of the *Petromyzonidae* family, which is ancestral to most vertebrates and all fish. Adult Pacific lamprey can be identified by the three large supraoral lamina teeth cusps in the suckerlike mouth. Females have a well-developed ventral fin fold, but the males have none. Larvae or ammocoetes have a dark line of pigment above and below the tip of the tail (Wydoski and Whitney 1979).

Range

The Pacific lamprey is distributed from Hokkaido, Japan, through the Bering Sea and Aleutian Islands to Baja California, Mexico (Ruiz-Campos and Gonzalez-Guzman 1996; Wydoski and Whitney 1979). Scott and Crossman (1973) describe this species as Apenetrating all major rivers, often to headwaters. Pacific lamprey have been seen in the Green River of Washington state, sometimes spawning on steelhead redds (Foley, S., WDFW, Pers. comm. June 29, 1998).

Life history

Pacific lamprey exhibit an anadromous life history. Although, landlocked populations have been reported from California, Oregon, Idaho and British Columbia (ODFW 1996; Wallace and Ball 1978; Wydoski and Whitney 1979). Adults are parasitic on a wide variety of fish, including benthic groundfish species as well as pelagic species such as Pacific herring (*Clupea harengus*) and Pacific salmon (*Oncorhynchus* spp.) (Beamish 1980; Scott and Crossman 1973; Stewart 1981). Pacific lamprey appear not to be piscvorous during metamorphosis or the spawning migration (Richards and Beamish 1981; Whyte et al. 1993). Pacific lamprey generally attach to their prey ventrally, especially near the pectoral fins; while river lamprey commonly attach dorsally (Cochran 1986). Adult Pacific lamprey are at times a very important food source for both saltwater and freshwater predators. In the Rogue River estuary in Oregon, Roffe and Mate (1984) documented that California sea lion (*Zalophus californianus*); Steller (or Northern) sea lion (*Eumetopias jubatus*); and the Pacific harbor seal (*Phoca vitulina richardsi*) fed heavily upon Pacific lampreys. Beamish (1980) cited observations of Pacific lamprey in the stomachs of sperm whales (*Physeter catodon*). Blue heron (*Ardea herodias*) and mink (Mustela vison) have been observed eating Pacific lamprey in fresh-water environments (Beamish 1980).

After spending approximately 3.5 years in salt water, adults enter natal streams between July and October, and gradually move upstream to spawn the following spring (Beamish 1980; Hart 1973). Migrating adults have been known to pass vertical barriers such as dams by slowly ascending smooth walls by the use of their sucker-like mouth (Wydoski and Whitney 1979). The length of sexually mature adults in Canada has ranged from 16-72 cm, but adults will atrophy approximately 20% of their maximum length prior to spawning (Beamish 1980). The spawning nest or redd usually consists of a shallow depression built in sand and gravel substrates at the upstream edge of a low gradient riffle (Close et al. 1995; Hart 1973; Scott and Crossman 1973). Flow and depth seems to be important in redd site selection, where velocities range from 1.6 to 3.3 ft/sec (0.5 to 1.0 m/sec) and depths of 1.3 to 3.3 ft (0.4 to 1.0 m) have been observed (Close et al. 1995). Lake spawning has been observed, but is uncommon (Russell et al. 1987). Adults generally die soon after spawning, although Michael (1980 and 1984) has observed some occurrence of repeat spawning returns of marked adults in traps within Puget Sound, Washington. After fertilization, eggs hatch in 2 - 4 weeks (19 days at 59EC (15EC) and newly hatched larvae (ammocoetes) remain in their nests for 2 - 3 weeks before drifting downstream and burying themselves in mud at the bottom of pools, or other areas of soft mud and sand (Hart 1973; Moyle 1976).

Ammocoetes are filter-feeders that subsist on algae or other organic matter for up to 5-6 years in their freshwater habitat (Moyle 1976; Wydoski and Whitney 1979). Under experimental conditions, emergent larvae 0.3 to 0.4 inches (7 to 10 mm) in length preferred mud over sand and

gravel substrates (Close et al. 1995). Current velocities greater than 1.0 ft/sec (0.31 m/sec) prohibited burrowing by emergent larvae in all substrates, but larger larvae 1.6 to 2.0 inch (40 to 50 mm) are capable of burrowing in sand. In Oregon, the current over ammocoete beds ranged from 0.3 to 1.6 ft/sec (0.1 to 0.5 m/sec) (Close et al. 1995). Metamorphosis begins in July and the known period of entry into salt water is from December to June, parasitic life starts soon after salt water entry (Beamish 1980; Whyte et al. 1993). Increased water flows during runoff can encourage outmigration, by washing away sand and silt the larvae require for anchoring themselves to the bottom (Hardisty and Potter 1971).

Population dynamics

Population dynamics of Pacific lamprey is unknown. Filter-feeding ammocoetes have a long (5-6 year) freshwater residence period that may benefit from increased nutrient input from salmonid carcasses.

Status and distribution

The limited amount of ecological information currently available about Pacific lamprey is insufficient to evaluate the species' population status in Washington state. However, in Oregon, this species is considered a species of concern, due primarily to its apparent widespread decline. Although the reasons for this decline are poorly understood, it is likely due to conditions both in oceanic and freshwater habitats; passage past hydroelectric and irrigation dams may also be a contributing factor throughout its range (ODFW 1996; Renaud 1997). Notably, a related species, the Arctic lamprey (*Lampetra japonica*), faces significant mortality in late spring and summer when low stream levels leave burrowed ammocoetes (larvae) stranded in dry stream edges (Scott and Crossman 1973).

Peregrine Falcon

The peregrine falcon (*Falco peregrinus*) was listed as endangered in the United States in 1970, and subsequently, in North America was removed from from the list of endangered and threatened wildlife on August 25, 1999 (64 FR 46542). The FWS completed this action because available data indicates that the species has recovered following the banning of DDT in Canada and the United States, restrictions on the use of other organochlorine pesticides, and implementation of successful management activities.

The Pacific Coast states have exceeded the delisting goal of 185 pairs by 54 pairs. The number of occupied eyries in Washington has increased from three known in 1980 and 1981 (Pacific Coast American Peregrine Falcon Recovery Team 1982) to 44 in 1997. Between 1993 and 1997, eyries in Washington obtained the average productivity goal of 1.5 young per pair. Threats to peregrine falcons include disturbance during the onset of their courtship activities (Fyfe and Olendorff 1975) and during nesting (Pagel 1991). Destruction of wetlands supporting waterfowl and other forage species, particularly near nesting areas and areas of winter concentrations is also of concern.

Pileated Woodpecker

Status

The pileated woodpecker (*Dryocopus pileatus*) is not a listed species, candidate species, or species of concern at the federal level in Washington. The pileated woodpecker is a state candidate species in Washington.

Range

The pileated woodpecker occurs from northern British Columbia south through the Pacific states to central California; in the northern Rockies through Idaho and western Montana; across southern Canada to Nova Scotia; and south to the Gulf Coast and Florida. The pileated woodpecker is found throughout forested areas of Washington state, primarily at low to moderate elevations (Smith et al. 1997). They can exist in the city when there are suitable trees, and are found in several parks in Seattle including Seward Park, Discovery Park, and Camp Long. The species does not occur in the dry, non-forested portions of the Columbia Basin (Smith et al. 1997).

Habitat

Pileated woodpeckers typically utilize mature and old-growth forests and second-growth forests with substantial numbers of large snags and fallen trees. West of the Cascade crest, pileated woodpeckers generally breed in forest stands older than 70 years, though they can use younger stands if large snags are present (Mellen et al. 1992). They excavate large nest holes (three holes per year per pair on average) in snags or living trees with dead wood, generally excavating through hard outer wood into rotten heartwood. Typical tree species used as nest sites include western larch, black cottonwood, and ponderosa pine east of the Cascade crest, and Douglas fir, grand fir, and western white pine, where available, west of the Cascade crest (Bull 1987; Mellen 1987; Nelson 1988). Most nest trees are hard snags with bark and broken tops (WDW 1991). In a study in the Oregon Coast Range, nest trees averaged 28 inches dbh, while in a northeastern Oregon study, nest trees averaged 33 inches dbh (Bull 1987; Mellen 1987; Mellen et al1992). Typical nest trees in the northeastern Oregon study had been dead more than 10 years, had broken tops, and an absence of limbs near the cavity.

Pileated woodpeckers also use tree cavities for roosting. In the northeastern Oregon study, these cavities were in hollow live or dead trees, mainly in stands of old-growth grand fir (Bull et al. 1992; Mellen et al. 1992)

Pileated woodpeckers forage mainly by excavating wood and chipping bark from large-diameter dead and down logs, stumps, snags, and live trees (FWSb 1996). They feed primarily on ants, beetle larvae, and other insects (Bull et al. 1992). West of the Cascade crest, they spend most time foraging in forest stands older than 40 years, and in deciduous riparian areas (Mellen et al. 1992). They seldom forage in clearcuts, but they are known to feed in timber harvest debris in shelterwood cuts.

Population dynamics and status
Pileated woodpeckers typically begin breeding at one year of age, and generally breed annually thereafter (Bull and Jackson 1995). The most common clutch size is 4 eggs (Bull and Jackson 1995). In northeast Oregon, 2 nesting adults were >9 years old and 3 others were >7years old. In western Washington, 43% of radio tagged adults survived 1 year (Bull and Jackson 1995). Breeding bird survey trend data show a -7.7%/year ($P < 0.08$, $n = 10$) from 1966 to 1979 and a +8.0% /year ($p < 0.00$, $n = 36$) from 1980 to 1997 (Sauer et al.1997).

River Lamprey

Status
River lamprey (*Lampetra ayresi*) is a federal and state species of concern in Washington state.

Species Description
River lamprey is a member of the *Petromyzonidae* family, which is ancestral to most vertebrates and all fish. Adult river lamprey can be identified by the two large supraoral lamina teeth cusps in the suckerlike mouth. Larval river lamprey have a black blotch in the membrane at the tip of the caudal fin (Wydoski and Whitney 1979).

Range
River lamprey have been collected from coastal streams and rivers from San Francisco Bay north to Juneau, Alaska (Wydoski and Whitney 1979). Scott and Crossman (1973) report that this species has been found in fresh and salt water across the same range. According to Wydoski and Whitney (1979), no detailed distribution records are available for Washington, but the species probably occurs in most major rivers. The regional distribution or river lamprey is relatively unknown because species identification of juvenile fish is rarely performed during river and stream surveys.

Life history
Biological information is not as well defined for river lamprey as it is for the larger-sized Pacific lamprey. Salt water mature adults are parasitic almost exclusively on pelagic species such as Pacific herring (*Clupea harengus*) and Pacific salmon (*Oncorhynchus* spp.) (Beamish 1980; Beamish and Neville 1995; Scott and Crossman 1973). In most British Columbia streams, river lamprey become parasitic before reaching the ocean (Stewart 1981). In Lake Washington, sockeye (*O. nerka*) salmon smolts are thought to be the preferred prey for recently metamorphosed river lamprey (Warner, E., Muckleshoot Indian Tribe, 1998, Pers. comm.). In 1991, Beamish and Neville (1995) concluded that river lamprey in the Fraser River plume killed approximately 65% and 25% of the total Canadian hatchery and wild production of coho and chinook salmon, respectively. This predation is considered to be significant upon commercially important fish stocks in British Columbia (Stewart 1981). River lamprey generally attach to their prey dorsally, while Pacific lamprey tend to attach ventrally, near the pectoral fins (Cochran 1986). Unlike numerous reports on Pacific lamprey, the extent of other animals feeding on river lampreys is unknown.

Between September and late winter, river lamprey return to freshwater after spending approximately two years in salt water (Beamish 1980). Spawning occurs during winter to spring in clean gravel areas of small tributaries (Beamish 1980; Moyle et al. 1995). The mean length of mature marine adults in Canada were 9.8 inches (25 cm) in September, but adults atrophy approximately 20% of their maximum length prior to spawning (Beamish 1980). River lamprey larvae (ammocoetes) may remain in their natal streams for several years, usually in silt-sand backwaters and eddies near the bank (Hart 1973). The ammocoetes are toothless, and they feed on microscopic plants and animals (Scott and Crossman 1973; Hart 1973). Metamorphosis occurs in late July with downstream migration occurring the following year from May to July (Beamish 1980; Beamish and Youson 1987). In the final stages of metamorphosis, lampreys congregate just upstream from salt water, entering the ocean in late spring (Moyle et al. 1995). From June until September they increase in size by an estimated 4.3 to 5.5 inches (11-14 cm) and 0.4 to 0.6 ounces (12-18 g).

Population dynamics

Population dynamics of river lamprey is unknown. Filter-feeding ammocoetes reside in natal streams for several years and may benefit from increased nutrient input from salmonid carcasses.

Status and distribution

Little is known regarding the status of river lamprey populations in Washington. Population declines of the related Pacific lamprey (*Lampetra tridentatus*) are primarily due to conditions both in oceanic and freshwater habitats; passage past hydroelectric and irrigation dams (ODFW 1996; Renaud 1997). Results of trawl surveys and surveys of sockeye smolts at the Ballard Locks indicate that river lamprey are a relatively common species in Lake Washington (Fresh, K., WDFW, 1998, Pers. comm.). Within the Straits of Georgia in British Columbia, approximately 667,000 adult lampreys were thought to exist in 1975 (Stewart 1981).

Tailed Frog

Status

The tailed frog (*Ascaphus truei*) is federal species of concern and a monitor species at the state level in Washington.

Range

The range of the tailed frog extends from southwest British Columbia through western Washington south to northwestern California (Leonard et al. 1993). In Washington, this species occurs in the Olympics, Cascades, and Blue Mountains, and the Willapa Hills of southwest Washington (Dvornich et al. 1997).

Habitat

Tailed frogs are adapted to cold, rocky streams, and their tadpoles are highly specialized for living in fast-moving streams (Leonard et al. 1993). Adults forage mainly on land along streambanks but also underwater, and seek cover under rocks and woody debris in streams

(Zeiner et al. 1988). Numerous studies have documented a close association between tailed frogs and late-successional forest (Blaustein et al. 1995). Tailed frogs are sensitive to canopy disturbance and increased sedimentation associated with timber harvest and management operations, modification of historical flooding regimes, and grazing (Corn and Bury 1989; Welsh 1990; Jennings and Hayes 1994).

The tailed frog has been associated with many different forest types, including Douglas-fir, redwood, Sitka spruce, ponderosa pine, and western hemlock (Jennings and Hayes 1994). Older (greater than 200 years) multi-layer forests, downed woody material, ground-level vegetation, ground cover, and canopy closure are all important predictors of the occurrence of tailed frogs in northwestern California and southern Washington (Aubry and Hall 1991). Tailed frogs have also been found in younger-age stands, indicating that on occasion suitable microhabitat conditions appear to be met in forests less than 200 years old (Corn and Bury 1989; Aubry and Hall 1991); however, the quality of these stands for tailed frogs may be greatly reduced by timber management activities.

Breeding and developmental habitat for the tailed frog generally consists of permanent, cool (usually less than 59° F) streams with cobble/boulder substrate and woody debris (DeVlamin and Bury 1970; Welsh et al. 1993). These microclimatic conditions are typically associated with cold, clear headwater to mid-order streams in older forest ecosystems (Welsh et al. 1993). Breeding occurs during late August and September, eggs are laid during the summer, and larvae remain in water for 2 - 3 years (Nussbaum et al. 1983). Because of the tailed frog's exceptionally long period of larval and pre-reproductive adult development (estimated 7 to 9 years), populations are particularly vulnerable to habitat disturbance, and are slow to recover (Daugherty and Sheldon 1982; Jennings and Hayes 1994).

Population Status

Populations of this species may be on the decline in Oregon (ODFW 1996). Local populations are highly susceptible to extirpation for several reasons, including narrow niche requirements combined with isolated population distribution, long generation time, and loss of mature forest along headwater stream habitats (Welsh 1990). Of seven Pacific Northwest anurans associated with old-growth forest, the tailed frog is probably the species most likely to be affected by old-growth habitat loss and degradation (Blaustein et al. 1995).

Van Dyke's Salamander

Status

Van Dyke's salamander (*Plethodon vandykei*) is a species of concern at the federal level, and a state candidate in Washington. It is also a USFS Survey and Manage species.

Range

Van Dyke's salamander is endemic to Washington, occurring in three population centers: the Cascade, Willapa, and Olympic Ranges (Leonard et al. 1993). In the Cascade Range, it is

known from 26 sites west of the crest to the Puget Trough, from central Skamania county in the south to the north end of Mt. Rainier in the north (Jones 1998). Populations are patchily distributed and of low density; much potential habitat appears to be unoccupied (Blaustein et al. 1995; Jones 1998).

Habitat

Van Dyke's salamanders are most commonly associated with headwater streambank or seep habitats, often in mature and old-growth coniferous forests (WDW 1991; Jones 1998). The Van Dyke's salamander is considered to be the most aquatic species of woodland salamander (Leonard et al. 1993); it has also been collected at considerable distances from free water, however, usually in microhabitats that retain moisture, such as north-facing slopes (Blaustein et al. 1995; Jones 1998). The species is typically located in the splash zone of creeks under rocks, logs, and wood debris (Leonard et al. 1993). It has also been found in wet talus, forest litter, lava tubes, and along montane lake shores (WDW 1991; Jones 1998). Two nests have been reported for this species: one was inside a partially rotten log alongside a stream (Jones 1989), another was under a moss-covered stone (Nussbaum et al. 1983).

The principal management recommendation of WDW (1991) is the maintenance of riparian corridors along all stream types, but especially Type IV and V Waters. Additional recommendations exist for protection of wet talus where the species is known to occur.

Population Status

Limited distribution and isolation of Van Dyke's salamander populations have prompted concern for this species' survival (WDW 1994). Its apparent association with riparian habitats in mature and old-growth forests led to this species' inclusion in the list of Survey and Manage species in the Northwest Forest Plan (USDA and USDI 1994). Lehmkuhl, Ruggiero and Hall (1991) compiled a list of species associated with late-successional Douglas-fir forests in the Pacific Northwest and modeled the risk of local extinction for each species from habitat loss or fragmentation. This model was based on frequency of occurrence, abundance, body size, and vagility of various species. The Van Dyke's salamander was determined to be a species at high risk (score of 9, on a scale of 1 to 10, with 10 being the highest).

Vaux's Swift

Status

Vaux's swift (*Chaetura vauxi*) is not a listed species, candidate species, or species of concern at the federal level in Washington. Vaux's swift is a candidate species at the state level in Washington.

Range

Vaux's swifts breed in western North America, from southeastern Alaska and British Columbia south and east into northern Idaho, western Montana, and northeastern Oregon, and south into Washington, Oregon, and northern California (Bull and Collins 1993). The species winters from central Mexico to northern South America (Ehrlich et al. 1988). Vaux's swift occurs throughout Washington state except for the driest parts of the Columbia Basin (Smith et al. 1997).

Habitat

The species nests in late-successional coniferous forests (Manuwal and Huff 1987; Bull and Collins 1993). In a survey of forests in the southern Washington Cascades, significantly more Vaux's swifts were counted in old-growth forest stands compared with younger seral-stage stands (Lundquist and Mariani 1991).

Vaux's swifts require large, hollow snags or cavities in the broken tops of live trees for nesting and night roosting (WDNR 1996). Nest snags on the west side of the Cascades are at least 39 ft tall and 25 in dbh (Brown et al. 1985). Bull and Cooper (1991) documented 21 Vaux's swift nests in a study in northeastern Oregon. All 21 nests were in large grand fir trees (26.4 inches mean dbh) hollowed out by a fungus and with an entrance excavated by pileated woodpeckers. The nest trees were mainly in old-growth forest stands. In a second study in northeastern Oregon, Bull and Hohmann (1993) found considerably more Vaux's swift nests in old-growth forest stands than in stands that had been logged in some manner. Occurrence of swifts appeared to be related to the number of dead grand fir trees that were at least 20 inches dbh (Bull and Hohmann 1993). Interestingly, swift nests were found in harvested areas if hollow trees remained (Bull and Hohmann 1993).

In fall, Vaux's swifts congregate in large flocks, and hundreds of swifts may use a single large hollow tree for night roosting. Bull (1991) described two roosts in broken-topped, hollow, live grand fir trees in old-growth forest stands in northeastern Oregon. Up to 400 swifts roosted in one of the trees.

Vaux's swifts feed on flying insects (Bull and Collins 1993), primarily over the forest canopy or open water. Brown (1985) reported that swifts forage over all seral stages of forest. Bull and Beckwith (1993) reported that they show a strong preference for foraging over open water.

Population dynamics and status

Breeding Bird Survey data for Washington indicate a significant decline in the number of Vaux's swifts for the 1982-1991 period (Sauer et al., 1997). Concern over the welfare of the Vaux's swifts relates primarily to their use of large, hollow trees for nesting and roosting (WDW 1991; Bull and Collins 1993).

ENVIRONMENTAL BASELINE

Regulations implementing the Act (50 CFR §402.02) define the environmental baseline as the past and present impacts of all federal, state, or private actions and other human activities in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed federal projects in the action area that have undergone section 7 consultation, and the impacts of state and private actions which are contemporaneous with the consultation in progress. Such actions include, but are not limited to, previous construction of water management facilities, river channel alterations, road construction, timber harvest, deforestation for agriculture, deforestation for urban/suburban development, and other land-use activities.

At this time, most of the property surrounding the lower portion of Green River Watershed, below Tacoma's ownership, is privately held, and managed as commercial forest land, or is in

some other land use, such as rural residential, or at the extreme lower end of Watershed, in urban and industrial land uses. Forest practices conducted on these lands are assumed to be conducted in compliance with Washington Forest Practices Regulations, as they exist currently (WDNR 1998), and as they will be amended in the foreseeable future (e.g. to conform to the April 1999 Forests and Fish Report (April 27th, 1999)). Land use conversions in the area surrounding the lower Watershed have been occurring at a rapid rate, and are expected to accelerate in the near term. It is assumed that development activities will be in compliance with King County's Growth Management Plan (King County 1998) and Critical Areas Ordinances, as they exist currently, and as they will be amended in the future, including the proposed year 2000 amendments that are specifically designed to respond to the listing of salmon and bull trout under the Act.

Listed Species

Gray Wolf

The most recent formal consultation for gray wolves in the action area has been the Intra-Service consultation of issuance of an incidental take permit to the WDNR for their HCP covering lands within the range of the owl (FWS 1997c) and the biological opinion and conference opinion for the City of Seattle, Seattle Public Utility's Cedar River Watershed HCP (FWS 2000). Also, the Intra-Service consultation for issuance of incidental take permits to Plum Creek Timber Company for their HCP covering lands in the Snoqualmie Pass area addressed gray wolves. All three of these consultations contain information on the Environmental Baseline, the Plum Creek consultation contains a more thorough accounting of the Environmental Baseline relative to gray wolves in the immediate area. (FWS 1996).

Bald Eagle

For updated information on the Environmental Baseline for bald eagles, the reader is encouraged to refer to the biological opinion for the Point Roberts Golf Course (FWS 1999b) and the biological opinion and conference opinions for the City of Seattle, Seattle Public Utility's Cedar River Watershed HCP (FWS 2000a) and the Simpson Timber Company Northwest Operations HCP (FWS 2000b).

Bull Trout

For the most recent update to the Environmental Baseline for bull trout in the Snoqualmie Pass area, the reader is encouraged to refer to the Re-initiated Intra-Service biological opinion to add Bull Trout to the Plum Creek Timber Company's HCP for the I-90/Snoqualmie Pass Area (FWS 1998a), and the biological opinion and conference opinions for the City of Seattle, Seattle Public Utility's Cedar River Watershed HCP (FWS 2000a), and the Simpson Timber Company Northwest Operations HCP (FWS 2000b).

Canada lynx

For the most recent update to the Environmental Baseline for Canada lynx the reader is encouraged to refer the biological opinion and conference opinion for the City of Seattle, Seattle Public Utility's Cedar River Watershed HCP (FWS 2000), and the biological opnion for effects of National Forest Land and Resource Management Plans and Bureau of Land Management Land Use Plans on Canada lynx (*Lynx canadensis*) in the contiguous United States (FWS 2001).

Grizzly Bear

The most recent formal consultation for grizzly bears in the action area has been the Intra-Service consultation of issuance of an incidental take permit to the WDNR for their HCP covering lands within the range of the owl (FWS 1997b) and the biological opinion and conference opinion for the City of Seattle, Seattle Public Utility's Cedar River Watershed HCP (FWS 2000). Also, the Intra-Service consultation for issuance of an incidental take permit to Plum Creek Timber Company for their HCP covering lands in the Snoqualmie Pass area addressed grizzly bears, and contains a more thorough accounting of the Environmental Baseline relative to grizzly bears in the immediate Green River area. (FWS 1996b).

Marbled Murrelet

For updated information on the Environmental Baseline for marbled murrelets in the Snoqualmie Pass area, including the most recent effects of other HCP actions, see the Re-initiated Intra-Service biological Opinion for the Plum Creek/ USFS I-90 Land Exchange (FWS 1999a) and the biological opinion and conference opinion for the City of Seattle, Seattle Public Utility's Cedar River Watershed HCP, (FWS 2000a) and the Simpson Timber Company Northwest Operations HCP (FWS 2000b). For a detailed discussion of range-wide habitat conservation plans affecting the marbled murrelet, refer to the biological opinion for the North Boundary Area Unit Management Plan (FWS 1998c).

Northern Spotted Owl

For updated information on the Environmental Baseline for owls in the Snoqualmie Pass area, including the most recent effects of other HCP actions, see the Re-initiated Intra-Service biological opinion for the Plum Creek/ USFS I-90 Land Exchange (FWS 1998a), and the biological opinion and conference opinion for the City of Seattle, Seattle Public Utility's Cedar River Watershed HCP (FWS 2000). For a detailed discussion of range-wide habitat conservation plans affecting the spotted owl, refer to the biological opinion for the North Boundary Area Unit Management Plan (USFWS1998c).

There are currently 16 known spotted owl activity centers within 1.8 miles of the HCP Area in the upper Green River basin. These represent 15 pairs of spotted owls (10 with confirmed reproduction) and one single spotted owl of unknown status. Nine of these lie within 0.7 mile of

the HCP Area, and one of the 16 is actually in the HCP Area. The entire watershed has undergone extensive surveying over the past decade, and these 16 activity centers are thought to represent all the resident spotted owls in or near the HCP Area (USDA 1996). The spotted owl is unlikely to occur in the mid- or lower Green River basins due to the absence of suitable habitat.

Other Covered Species

Because other covered species are not currently listed, proposed or candidates, the FWS has not been conducting section 7 consultations upon them, nor tracking take, as defined in the Act. For these species, however, within western WA, there are 6 completed forestry HCPs that have included regulatory assurances for all, or most, of the other species included in the Tacoma's HCP, Simpson Timber Company Northwest Operations HCP, completed in October 2000; City of Seattle HCP completed in April of 2000; WDNR HCP, completed in January of 1997; Port Blakely Tree Farm's HCP for the Robert B Eddy Tree Farm in SW WA, completed in July of 1996; Plum Creek Timber Company's HCP for the I-90/Snoqualmie Pass area, completed in June of 1996; and Murray Pacific Corporation's Amended Multi-species HCP in eastern Lewis County, completed in June of 1995. With the exception of City of Seattle and Plum Creek's HCPs, these plans are "all-species" HCPs, and, as such, the landowners have assurances from the Services that absent a jeopardy finding, any and all newly listed species will be added to their Incidental Take Permits without imposition of additional mitigation or minimization measures, as per the No Surprises Regulations promulgated by the Services (63 FR 8859, Feb 23, 1998). City of Seattle and Plum Creek's HCPs Are not an "all-species" HCP; rather, they cover 181 and 285 species, respectively, that are known or likely to occur in the habitats present on these ownerships. These plans include all species being sought by Tacoma for coverage in the Green River HCP.

Of these completed HCPs, the WDNR HCP, covering 1.6 million acres of forestland, has by far the greatest effect on the welfare of these other unlisted covered species. This HCP includes property adjacent to and in the Upper Green River Watershed, including old growth and other habitat types of interest. The City of Seattle and Plum Creek's HCPs probably have next greatest effect upon unlisted covered species included in the Tacoma's HCP, due to their total acreage (250,000 acres), and their proximity to the Upper Green River Watershed. Murray Pacific's and Port Blakely's HCPs have substantially less importance to unlisted species included in Tacoma's HCP due to their distance from the Watershed (>50 mi and >100 mi, respectively) and their smaller acreage (55,000 acres and 7,500 acres). Simpson's HCP covers 260,000 acres, but it also located more than 50 miles from Tacoma's covered lands.

The Northwest Forest Plan, instituted in April 1994 on all USFS lands and Bureau of Land Management lands within the range of the northern spotted owl (totaling > 24 million acres), is a multi-species, landscape-level forest management plan. The Northwest Forest Plan is designed to protect old growth- dependent species and provide a sustainable level of timber harvest. The Standards and Guidelines contained in the Northwest Forest Plan include survey requirements for

many of the other species sought by Tacoma for coverage, as well as protective measures such as buffers and seasonal restrictions designed to minimize deleterious effects of forest management upon these other species. Federal lands that surround or are located within the Upper Green River Watershed and Cedar River Watershed to the north contain most of the old growth habitat in the central Cascades.

STATUS OF THE SPECIES (in the action area)

Listed species/critical habitat

For the purposes of this consultation and for these Covered Species, the FWS has determined the action area to be the Green River Watershed and its immediate surroundings (within 3 miles of the action area). However, for the aquatic species that occur downstream of Tacoma's headworks, and could be affected by the aquatic conservation measures, the action area extends down to river Mile 11.0. These species include bull trout, coastal cutthroat trout, Dolly Varden, and Pacific and river lampreys.

Gray Wolf

Range limits of the gray wolf predicted by gap analysis modeling do not include the HCP Area (Johnson and Cassidy 1997), but there is nothing to preclude gray wolves from utilizing this area. One wolf was sighted in 1992 in the USFS Green River Watershed Analysis Area (USDA 1996) and in 13 other parcels in the I-90 Land Exchange parcel groups at Snoqualmie Pass (I-90 North), Bald Mountain, and Randle (USDA 1998). Although the species is considered rare, it is possible that it could inhabit the upper basin where Tacoma's covered lands are, but unlikely not the lower and+ mid-basin areas of the Green River.

Bald Eagle

The bald eagle inhabits the upper basin and mid-basin areas of the Green River, and possibly the lower basin as well. Bald eagle nesting has been confirmed mostly in the lowlands and foothills of eastern King and Pierce Counties, although possible breeding sites were identified in the Cascades of King County (Smith et al. 1997). A pair of nesting eagles was reported at Eagle Lake, which is one mile northeast of Howard Hanson Reservoir (USDA 1996). In the mid-Green River basin, a nest (WDW reference number 903627) has been documented in a residential area adjacent to Lake Sawyer. There are also several other lakes in this vicinity which could potentially provide foraging opportunities, but eagles have not been observed foraging there (Beak 1996). Surveys conducted in 1981, 1982, 1989, and 1993 have detected adult bald eagles near HHD and along the Green River, Tacoma Creek, and Pioneer Creek (USDA 1996). Bald eagles are present year-round near the reservoir. Below the HHD there are seasonal runs of salmon and steelhead, and above the dam, there are non-anadromous fish and abundant waterfowl for foraging. Potential habitat for winter roosts is available above the dam (USDA 1996). Approximately 3,709 acres of potential nesting habitat was identified within the USFS

Green River Watershed Analysis Area (USDA1996) and 5,582 acres of foraging habitat are available.

Canada Lynx

Range limits of the lynx predicted by gap analysis modeling do not include the HCP Area (Johnson and Cassidy 1997); however, one male was apparently observed in the USFS Green River Watershed Analysis Area in 1979 (USDA 1996). No lynx have been documented in the I-90 Land Exchange parcel groups (USDA 1998). Although the species is considered rare, it is possible that it inhabits the upper basin, but not the lower and mid-basin areas of the Green River.

Bull Trout

Numerous studies have attempted to ascertain the extent to which bull trout are present in the Green/Duwamish River. The USFS conducted surveys in the upper Green River drainage and Sunday Creek basin over a series of years and found no evidence of native char (F. Goetz, USACE 1998). The USFS (USDA 1998) determined that no records exist that suggest bull trout have ever occupied habitat upstream of HHD. In support of their Permit application for lands in the upper Green River watershed, Plum Creek Timber Company biologists conducted presence/absence surveys for bull trout, however, no bull trout were detected (Watson and Hillman 1997). Streams included in this survey were: upper Green River, Twin Camp Creek, Intake Creek, Sawmill Creek, Pioneer Creek, and Tacoma Creek. Three reaches were sampled on each stream (6.2 mile/reach and 12 transects/reach). The surveys consisted of snorkeling and electrofishing during daylight hours and only during one field season (Watson and Hillman 1997).

The bull trout habitat in the upper Green River is considered somewhat degraded due to past timber harvests. Stream temperatures in this survey area may be warmer than temperatures required by bull trout in the late summer. Bull trout thrive in waters that are too cold for other salmonid species. The Green River is a low elevation system, and may not provide the cold water habitat necessary for bull trout success.

However, there is evidence that native char may have historically occurred in the lower Green River/Duwamish River Basin (Grette and Salo 1986). Historical records report thousands of native char in the Green River system (RM 35) in the 1800s. This report was prior to separation of the Green and White River systems. The White River was diverted into the Puyallup River in 1906 and continues to support a large population of native char.

No bull trout were observed during fisheries surveys conducted in the reach between HHD and the Tacoma Headworks intake in 1985 and 1994 (Solonsky 1985; Dillon 1994). These surveys were one day, daylight only, snorkeling efforts by trained field crews. Trapping studies conducted between the HHD and the Headworks did not report catches of native char (Hatfield

1986). Anglers in the Headworks areas have not reported catching native char. Cropp (1989) set vertical and horizontal gill nets in Howard Hanson Reservoir in August, 1989, and collected only chinook, coho, steelhead, plus native cutthroat and whitefish, no native char were collected. Electrofishing and fyke net surveys conducted in the middle Green River (RM 34-45) did not capture bull trout (R2 1999).

The documented presence of native char in the Green River system is limited to the capture of solitary adult specimens in the lower river reported in 1956 and 1994. A single bull trout sighting was reported in Soos Creek in 1956. No supporting information regarding this sighting is available (Beak 1996b). The capture of a solitary bull trout in the Duwamish River system (lower Green River) by E. Warner of the Muckleshoot Indian Tribe in 1994, referenced in FWS proposed listing of bull trout under the Act, is more likely indicative of movement between river systems than the presence of a "depressed" population in the Green River (63 FR 31693). More recently, 8 individuals of native char were collected in Turning Basin of Duwamish River. Beach seining was conducted every two weeks beginning April 19, 2000 (Kellogg Island and the Turning Basin were also sampled on April 14, 2000) and ending October 23, 2000. Turning Basin beach seines were conducted from the western side of the Duwamish River. Two char were caught on August 10, 2000 and six were caught on September 11, 2000 Habitat in the area consisted of a gentle sloping intertidal and subtidal mud flat. All fish were fin clipped for genetic analysis. Fin clips were delivered to Mr. Bill Mavros of the King County Department of Natural Resources (Taylor Associates 2001).

The observations of solitary sightings of large native char in themselves do not indicate a reproducing population is present in the Green River. Bond (1992) maintained that movement between river systems during feeding forays to saltwater is a potential mechanism of bull trout distribution. Anadromous Dolly Varden are known to temporarily inhabit lower portions of non-natal rivers before returning to their natal stream to spawn (Bernard et al. 1995). Native char in southeast Alaska have been observed migrating through salt water as much as 226 km between river systems before entering their natal streams (Armstrong and Morrow 1980). One adult bull trout radio-tagged in the Sauk River, a tributary to the Skagit River, was recovered six months later in the lower Snohomish River (WDFW 1998). Native char have the opportunity to move in and out of the Green River, and infrequent solitary sightings of adults in the lower reaches further suggest such movement between river systems may be occurring in the Puget Sound area.

Grizzly Bear

Range limits of the grizzly bear predicted by gap analysis modeling do not include the HCP Area (Johnson and Cassidy 1997). However, grizzly bears have been documented to the south in Kapowsin, Pierce County (U.S. Army Corps of Engineers 1997) and in four parcels near Snoqualmie Pass in the I-90 North Parcel group land exchange area. Although the species is considered rare, it is possible that it inhabits the upper basin, but not likely the lower and mid-basin areas of the Green River.

Marbled Murrelet

The population of marbled murrelets in the upper Green River watershed is small. Surveys for nesting murrelets have been conducted over several years, but only recently has occupancy been detected for two site on USFS lands. These sites are adjacent to the Covered Lands. Marbled murrelets are not currently expected to occur on the Covered Lands due to the absence of suitable habitat.

Proposed Species:

Dolly Varden (See bull trout baseline)

Candidate species:

Oregon Spotted Frog

The lower and mid-Green River basins occur within the historical range of the Oregon spotted frog, but only a few historic records have been documented in the Puget Sound lowlands of King County (Dvornich et al. 1997). One unconfirmed observation of an adult was reported during surveys in 1995 along Upper Sunday Creek (USDA 1996) in the upper Green River basin, but this location is closer to the known range and habitat of the more abundant, Columbia Spotted Frog (*Rana luteiventris*). Given the rarity of *R. pretiosa* in Washington and lack of historic records in eastern King County, their presence in the upper Green River basin above Headworks is very unlikely. Approximately 348 acres of potential suitable habitat was identified within the USFS Green River Watershed Analysis Area (USDA 1996).

Other species:

California Wolverine

Range limits for wolverines, predicted by gap analysis modeling, include the HCP Area (Johnson and Cassidy 1997). Records show one individual which was apparently observed in the USFS Green River Watershed Analysis Area in 1983 (USDA 1996) and two other sightings are known from the I-90 Land Exchange Parcels at the Cascade Crest parcels (USDA 1998). Although the species is considered rare, it is possible that the wolverine inhabits the upper basin, but not the lower and mid-basin areas of the Green River.

Cascades Frog

Records of the Cascades frog exist throughout the Cascade region, including the eastern half of King County (Dvornich et al. 1997). Surveys in the Snoqualmie Pass area revealed that it is very abundant in some areas. In 1994 and 1995, presence was recorded at 19 sites, with reproduction found at 11 of the sites in the upper Green River basin (USDA 1996). Cascades frogs were

found reproducing in all beaver ponds that were surveyed (USFS 1996). Habitat models predicted a total of 38,220 acres of suitable habitat in the USFS Green River Watershed Analysis Area, which includes 380 acres of wet meadows, 102 acres of shrubby wetlands, 115 acres of lakes/ponds, and 37,623 acres of less preferred streamside habitat (USDA1996). The Cascades frog is locally abundant in high elevation areas (> 2,000 feet) in the upper Green River watershed above the Tacoma Headworks, but is not expected to inhabit the lower and mid-basins of the Green River.

Cascade Torrent Salamander

The HCP Area is not within the known range of the Cascade torrent salamander. There are no records of the species for King and Pierce counties (McAllister 1995; Dvornich et al. 1997). The closest known sighting to the HCP Area of a Cascade torrent salamander is from the border of Thurston and Lewis counties (Dvornich et al. 1997). The species is unlikely to occur in the HCP Area because of its rarity and lack of historical range within the Green River Watershed. Although the species could potentially inhabit the upper basin, it is not very likely in the lower and mid-basin areas of the Green River due to the lack of cold, headwater streams at lower elevations.

Common Loon

Common loons have been confirmed breeding on the Howard Hanson Reservoir (Smith et al. 1997) and on Eagle Lake located about one mile northeast of the reservoir (US Army 1998). In addition to breeding loons, migrant loons have been observed in other seasons (U.S. Army Corps of Engineers 1998). Overall, these are the only two large water bodies in the upper Green River basin which could support nesting by loons. Nesting is not expected in the lower and mid-sections of the Green River basin, given the complete lack of known breeding sites at these lower elevations in King County (Smith et al. 1977).

Coastal Cutthroat Trout

A coastal cutthroat trout population is present in the Green River, however, little information exists on their status (Grette and Salo 1986). The population inhabiting the Green River appears to be small when compared to other streams in Puget Sound (Grette and Salo 1986). Cutthroat trout fry and juveniles (age 1+) were captured in lateral habitats of the middle Green River during juvenile salmonid surveys conducted in 1998 (R2 1999). However, their numbers and distribution relative to other juvenile salmonids appear to be limited.

Larch Mountain Salamander

Until recently, there were no records for the Larch Mountain salamander in King County. However, five new records have emerged in the vicinity of Snoqualmie and Stampede passes (Dvornich et al. 1997; USDA 1997, 1998) with two records from the upper Green River Watershed. Habitat models predicted some 18,792 acres of suitable habitat in the USFS Green

River Watershed Analysis Area, plus an additional 768 acres of talus and cliff habitat (USDA 1996). The Larch Mountain salamander is a resident of the upper Green River Watershed, but may also occur at lower elevations in the mid-Green River basin (below Headworks) if suitable talus habitat is available. It is unlikely to occur in the lower Green River because old-growth forest and steep talus slopes are virtually absent along this stretch.

Northern Goshawk

Records of nesting goshawks exist throughout the Cascades region, including the far eastern half of King county (Smith et al. 1997). In the upper Green River Land Exchange Area, there were five records of individual goshawks (USDA 1998). No formal surveys were conducted to locate goshawk nests in the USFS Green River Watershed Analysis Area (USDA 1996), but habitat models predicted 5,489 acres of suitable nesting habitat within scattered parcels. It is highly likely that goshawks are nesting in the upland forests of the upper Green River watershed because of the presence of suitable habitat and adequate , unlikely for the mid-Green River basin, and extremely unlikely for the lower Green River basin because of increasing urbanization and habitat fragmentation. Outside of nesting territories, occasional wintering goshawks could appear in all areas of the Green River basin for variable periods of time, but are less likely to take-up winter residency in urbanized areas or in young regenerating forests (<40-years old).

Northwest Pond Turtle

Records of the northwestern pond turtle in Washington are mainly from the southern end of the Puget Sound lowlands, with several records from western King county (Dvornich et al. 1997). The species could be present in lowland habitat of the lower and mid-Green River basins, but because of its extreme rarity and specialized wetland requirements, presence is unlikely. Lack of historical records in the Washington Cascades and limited elevation (<1,000 feet) tolerance in Washington, make this species extremely unlikely to occur in the upper Green River basin above Headworks.

Olive-sided Flycatcher

Olive-sided flycatchers have been recorded extensively throughout nearly all of King county (Smith et al. 1997) and are likely to be present in the HCP Area. The species is more likely to inhabit the upper basin, but can also be found in areas adjacent to the lower and middle Green River.

Pacific Fisher

Range limits for fishers, predicted by gap analysis modeling, include portions of the HCP Area (Johnson and Cassidy 1997). Records show one individual which was apparently observed in the USFS Green River Watershed Analysis Area in 1984 (USDA1996). No recent sightings are known from the I-90 Land Exchange parcels (USDA1998). Although the species is considered rare, there is a reasonable possibility that fishers may currently inhabit the upper basin. They are not expected to inhabit the lower and mid-basin areas of the Green River.

Pacific Lamprey

Little information exists regarding the status of Pacific lamprey in the Green River. Pacific lamprey ammocoetes were common during lateral habitat surveys in the Green River, conducted from late February through late June, 1998 (R2 1999). Relative abundance of Pacific lamprey ammocoetes was greater than other lamprey species encountered during all electrofishing surveys conducted on the middle Green River (RM 35-45). Pacific lamprey were captured in each habitat type surveyed (i.e., gravel bar pools, mainstem sloughs, mainstem margins, backbar channels, abandoned channels, and wallbase channels) (R2 1999).

Peregrine Falcon

Breeding sites are relatively rare within the interior of Washington (Smith et al. 1997), but several eyries have been reported in the central and southern Cascades (Stofel 1997). Two recent breeding records for King county are from downtown Seattle (Smith et al. 1997) and Mount Si (Stofel 1997) which is adjacent to the town of North Bend. At least four individual peregrines have been seen during incidental observations in the upper Green River basin (1981, 1983) (USDA 1996). There are 601 acres of suitable cliff habitat for peregrine nesting in USFS Green River Watershed Analysis Area, but none of these potential habitats appeared to be occupied during a helicopter survey in 1988 (USDA 1996). Although the species is considered rare, it is possible that it inhabits the upper basin. It is not likely to inhabit the lower or mid-basin areas of the Green River.

Pileated Woodpecker

The pileated woodpecker breeds extensively in King county (Smith et al. 1997) and is a breeding resident of the HCP Area. Two known pairs and several other individuals have been noted in the USFS Green River Watershed Analysis Area in 1979, 1981-1983, 1985, 1986, 1991, and 1993 (USDA1996). There is concern for this species in the upper Green River basin since over 50 percent of the area has less than 1 snag per acre (USDA 1996). Large portions of the area have no suitable nest snags and no potential for recruitment for at least 70 years (USDA 1996). The species inhabits the upper basin and likely inhabits the lower and mid-basin areas of the Green River as well.

River Lamprey

Two river lamprey were observed during juvenile salmonids surveys of lateral habitats in the middle Green River (R2 1999). Little other information exists on the occurrence of river lamprey in the Green River. River lamprey are of no sport or commercial value (Johnson 1986) and while parasitic on fish, there is no accurate assessment of the damage to fish populations (Johnson 1986). Past physical damage to juvenile salmonids has been reported in the Green River, however, no juvenile salmonids (out of 4,736 total salmonids) captured during middle Green River electrofishing surveys displayed lamprey wounds (R2 1999).

Tailed Frog

Records of the tailed frog exist mainly throughout the eastern half of King county, with a large concentration of sightings in the Stampede Pass area (Dvornich et al. 1997). Kelsey (1995) located tailed frogs in the Friday Creek drainage in the upper Green River watershed. This site is well within the range of the tailed frog and the species is very likely to occur in other suitable streams (DNR Type 4) in the area that are bordered with sufficient forest cover (USDA 1996). Approximately 7,257 acres of potential habitat was identified within the USFS Green River Watershed Analysis Area (USDA 1996). Although the species inhabits the upper basin, it is not very likely in the lower and mid-basin areas of the Green River due to the lack of cold, headwater streams at lower elevations.

Van Dyke's Salamander

No published records currently exist for King county, although a limited number of occurrences have been reported less than 30 miles to the south in adjacent Pierce county (McAllister 1995; Dvornich et al. 1997). No survey and manage protocol surveys for the Van Dyke's salamander were conducted in the USFS Green River Watershed Analysis Area, but one incidental sighting was recorded along Twin Camps Creek (USDA 1996) near covered lands. Habitat models predicted some 28,658 acres of suitable habitat in the Watershed Analysis Area, plus an additional 768 acres of talus and cliff habitat (USDA 1996). Although the species inhabits the upper basin, it is not very likely in the lower and mid-basin areas of the Green River due to a scarcity of forested riparian zones along lowland stream and creeks.

Vaux's Swift

The Vaux's swift breeds throughout the Washington Cascades and is documented extensively in King county (Smith et al. 1997). At least 49 individuals have been reported in the upper Green River basin (USDA 1996). There is a reasonable possibility that it inhabits the lower and mid-basin areas of the Green River as well.

EFFECTS OF THE ACTION

Introduction

Tacoma owns and manages approximately 14,888 acres in the upper Green River Watershed, of which, 11,644 acres are forested. The remaining 3,244 acres consist of maintained power line rights-of-way (1,822 acres), reservoir (578 acres), river (547 acres), grass (152 acres), rock (50 acres), open areas (29 acres), facilities (26 acres), gravel pits (21 acres), and railroad (17 acres). Tacoma manages their forested lands to: 1) protect water quality, 2) provide for fish and wildlife habitat, and 3) generate revenues through timber harvest to fund land management and acquisition. Tacoma's primary management objective is to protect water quality, and the HCP was developed around this objective. To achieve these objectives, Tacoma, under the HCP, divided their ownership into three management zones, (Natural, Conservation, and Commercial) and has developed specific management regimes and conservation measures to address the preservation and management of each zone. The amount of forest-management activity than can occur in each of these zones correlates with the zone's distance from the Green River and its major tributaries and potential negative effects of management on water quality and important fish and wildlife habitat. Riparian buffers committed to in the HCP apply in all three of the zones, but their affects on water quality and fish and wildlife habitat will only be apparent in those zones and portions of zones where Tacoma will conduct harvest activities.

The Natural Zone encompasses lower elevation lands directly adjacent to the Green River, major tributaries, and HHD Reservoir. There are 5,850 acres in the Natural Zone, 2,856 acres of which are coniferous forest. The remaining acres mainly include hardwood forests (1,763 acres), reservoir (578 acres), river (546 acres), rock (38 acres) and power line rights-of-way (36 acres). This zone extends upland from these water bodies for a minimum of 200 feet. This zone also includes two large blocks totaling roughly 1,000 acres of mid-successional forests (80 to 90 years old) with old growth remnants considered important to spotted owl and marbled murrelet management. The management objective in the HCP for the Natural Zone is to allow forest stands to develop, without intervention, into mature (100 to 155 years old) and late-seral (>155 years old) forest stands.

The Conservation Zone lies directly upland of the Natural Zone and includes mainly conifer forests (2,307 acres), hardwood forests (850 acres), power line rights-of-way (1,786 acres), grass (147 acres), open fields (26 acres), gravel pits (14 acres), and rock outcrops (4 acres). There are a total of 5,143 acres in the Conservation Zone. The goal of the Conservation Zone is also to establish mature and late-seral coniferous forest conditions, but a broader array of forest management practices will be allowed in this zone. All coniferous forest stands over 100 years old will not be subject to harvest during the term of the HCP. These stands will be allowed to develop mature and late-seral forest conditions, without intervention, similar to stands in the Natural Zone. The remaining forested lands, excluding no-harvest and partial-harvest riparian buffers required by the HCP, will be managed under an uneven-aged harvest regime to accelerate or enhance old forest conditions. Harvest may be conducted periodically to thin stands, but when

conducting the final uneven-aged harvesting, Tacoma will leave a minimum of 50 dominant or co-dominant conifers per acre dispersed across the harvest unit with no forest openings greater that 10 acres. The intent of the uneven-aged harvest retention standard of 50 or more healthy dominant or co-dominant conifer trees per acre is to ensure that a sufficient number of trees remain after harvest per stand to develop into fully stocked stands of large trees by the time stand age reaches 100 years old. Once these stands reach the age of 100 years, no additional timber-harvest activities will be allowed under the HCP. On average, no more than 2 percent (46 acres) of the coniferous stands in the Conservation Zone will be harvested in any year.

The Commercial Zone are those lands that Tacoma has identified as areas where commercial forest practices can occur consistent with the protection of water quality while minimizing the impact on fish and wildlife habitat. Within the limitations of the conservation measures outlined in the HCP, Tacoma's objective is to grow and harvest timber on a sustainable basis while minimizing impacts to water quality and fish and wildlife and their habitats. Stands will be managed on at least a 70 year even-aged rotation. On average, no more than 1.5 percent (49 acres) of the commercial lands conifer-dominated stands will be harvested in any year during the term of the HCP and no single harvest unit will exceed 40 acres in size. Additionally, no-harvest and partial-harvest riparian buffers; species-specific timing restrictions; and snag, green recruitment trees, logs as well as other conservation measures in the HCP will be met prior to harvest. The Commercial Zone contains 3,858 acres. Excluding riparian buffers and Upland Management Area (UMA), approximately 3,285 acres of the 3,858 acres will be available for commercial harvest. In total, 3,538 acres of the Commercial Zone are conifer forest, another 294 acres are dominated by hardwoods, and 26 acres are non-forested lands.

Under the HCP, timber harvest will only occur on lands with a Douglas-fir 50 year site index of 80 or greater. Lands with lower site indices will be designated as UMAs and will not be subject to harvest. Sites with lower productivity are capable of producing commercial size timber, but theses sites are often expensive to harvest, difficult to regenerate, and susceptible to water quality impacts. To avoid the potential impacts associated with harvesting and subsequent regeneration of these areas, Tacoma has committed to refrain from harvesting theses sites and retain them as habitat over the term of the HCP. Currently, there is approximately 103 acres of UMAs in the Conservation Zone and 150 acres of UMAs in the Commercial Zone. Additional acres could be added to these amounts as other sites with low productivity are identified by Tacoma during harvest planning activities.

Tacoma has agreed to retain all safe snags, a minimum of four green recruitment trees, and four logs per acre harvested. If at least six suitable snags as defined in HCM 3-01G in the HCP are not available per acre harvested, additional green recruitment trees will be retained at a ratio of 1 to 1. If less than two snags are available per acre, Tacoma will actively create 2 snags per acre from 2 of the larger green recruitment trees.

Tacoma will retain no-harvest riparian buffers along all streams and wetlands within covered lands. No-harvest buffer widths will vary according to stream and wetland types. No-harvest riparian buffers on WDNR Stream Types 1 and 2 will be 200 feet wide. No-harvest buffers on Type 3 streams will be 150 feet wide. No-harvest buffers on Type 4 streams will be 50 feet and expand out to 100 feet at key locations. These locations are at the origin of Type 4 streams, at headwalls and along steep and unstable slopes, at confluences with other Type 4 streams, at the confluences of Type 4 streams with fish-bearing streams, around springs and seeps, and along low gradient reaches. No-harvest riparian buffers on Type 5 streams will be 25 feet wide. In addition, the HCP requires partial-harvest riparian buffers 50 feet wide on Type 3 streams and 25 feet wide on Type 5 streams. These buffers are in addition to and located on the upland side of the no-harvest buffers required for these stream types. When conducting partial harvest on Type 3 stream buffers, Tacoma has agreed under the HCP to leave the largest 70 coniferous trees per acre. On Type 5 streams, Tacoma has committed to retaining the largest 50 coniferous trees per acre. All buffers widths will be measured horizontally on both sides of the stream from the ordinary high water mark, channel migration zone, or channel disturbance zone whichever is greater.

Wetland buffers will also vary in width according to the size and type of wetland encountered (See table 5.3 of the HCP). Non-forested wetlands with at least 0.5 acre of open water will receive 100 to 200 foot no-harvest buffers. Non-forested wetlands with less than 0.5 acre of open water will receive 50 to100 foot no-harvest buffers. Forest wetlands described as greater than 30 percent canopy coverage will receive no-harvest buffers varying in width from 25 to 50 feet depending on whether the size of the wetland is 0.50 to 5.0 acres or greater than 5.0 acres. All buffers will be measured horizontally from the edge of the wetland.

A total of 2,125 acres of no-harvest riparian buffers and 189 acres of partial-harvest riparian buffers along streams are estimated to be within riparian management zones on Tacoma lands. Approximately 1,440 of these acres are located in the Natural Zone where no harvest will occur. The Conservation Zone has 289 acres (plus 72 acres in partial-harvest buffers) and the Commercial Zone has 397 acres (plus 117 acres in partial-harvest buffers) in riparian management zones. The amount of buffers around wetlands is not determinable at this time, but it is additive to the acres in stream-adjacent buffers.

To reduce impacts of sediment from road construction and maintenance Tacoma will: 1) participate in Watershed Analysis, 2) participate in the development and implementation of a Road Sediment Reduction Plan, 3) implement mass wasting prescriptions from Watershed Analysis for all new road construction, 4) use full bench construction with no side-casting of material on all side slopes greater than 60 percent, 5) mulch and seed all road cuts, 6) maintain locked gates to restrict road access, 7) abandon all roads that are no longer needed for watershed management, forestry, or HCP implementation, 8) replace all culverts that block fish passage, and 9) discontinue heavy truck traffic when there is a potential for excessive road damage or water quality impacts that would adversely affect fish.

Listed Species

Gray Wolf

No comprehensive surveys have been conducted by Tacoma or others in the upper Green River Watershed, but human use is frequent. The most recent sighting of a gray wolf in the Watershed was in 1992 (USFS 1996). Since this species is readily identifiable by both sight and sound and there has not been a consistent history of detections of this species in the Watershed, it is unlikely that gray wolves currently reside in the upper Green River Watershed. Gray wolves are generally associated with large home ranges (Scott 1972) and utilize a wide variety of habitat types ranging from open non-forested to older closed canopy forests provided adequate prey species are present and disturbance by humans minimal.

Mitigation and Minimization Measures

Minimization and mitigation measures for gray wolves include the protection and establishment of mature and late-seral coniferous forest conditions in the Natural and Conservation Zones as well as in UMAs and riparian buffers. Coniferous forests in the Natural Zone, stands greater than 100 years old in the Conservation Zone, UMAs, and no-harvest riparian buffers will be allowed to develop without intervention over the life of the permit, while the remaining lands in the Conservation Zone will be managed to accelerate the development of late-seral and mature coniferous forest conditions. No timber harvest will occur once these stands reach 100 years old. This will allow stands to develop mature and late-seral conditions through natural succession.

Tacoma will not conduct timber felling, yarding, road construction, blasting, or use of helicopters for commercial timber harvest and silvicutural activities within 1.0 mile of any known active gray wolf den from March 15 through July 15. Tacoma not will conduct timber felling, yarding, road construction, blasting, or use of helicopters for commercial timber harvest and silvicutural activities within 0.25 mile of any known active gray wolf first rendezvous site from May 15 through July 15. Tacoma will also contact the FWS and WDFW prior to conducting harvest activities outside the denning season within 0.25 mile of a known den site to discuss and implement minimization measures around known den sites.

Tacoma will also prohibit firearms within the vehicles of contractors working for Tacoma in the Watershed except when being used for security, as part of a WDFW-approved hunt, or by tribal hunters. As general measures, Tacoma will abandon roads on covered lands that are no longer necessary and where Tacoma has control over road use, Tacoma will maintain locked gates to restrict use of roads by the general public. These measures will reduce the likelihood of a gray wolf being struck by vehicle or accidentally shot.

Primary Beneficial and Detrimental Effects

Habitat Effects

Considerable acreage of mature and late-seral forests is expected to develop in the Natural and Conservation Zones and to a lesser extent in the UMAs and riparian buffers. Over the 50 year life of the HCP, the total amount of mature coniferous forest (106 to 155 years old) on Tacoma

lands is anticipated to increase from 268 acres to 4,027 acres. In addition, the total amount of late-seral coniferous forests (>155 years old) is expected to increase from 41 acres to 292 acres. By permit expiration, 82 percent of the late-seral forest (238 of 292 acres) and 64 percent of the mature forest (2,593 of 4,027 acres) will be in the Natural Zone. Five percent (15 acres) of late-seral forest and 29 percent (1,161 acres) of mature forest will be in the Conservation Zone. Large blocks of mature forested habitat that develop in the Natural and Conservation zones will provide secure, undisturbed habitat for wolves and wolf prey species.

The remaining 13 percent (39 acres) of late-seral and 7 percent (272 acres) of mature forest will be contained in UMAs and riparian buffers. By 2048 it is projected that all riparian areas will be 55 years of age or older, with 4 percent of these areas exceeding 155 years old. Once established, riparian buffers function as travel corridors and calving areas for important prey species such as deer and elk. Riparian buffers will occupy 2,125 acres of the covered lands. Although UMAs constitute a small portion of Tacoma's ownership, these areas are not subject to harvest and consequently could provide additional habitat for gray wolves and prey species. There are currently 103 acres of UMAs in the Conservation Zone and 150 acres in the Commercial Zone. In total, approximately 6,957 acres will be managed for, and 4,319 acres (29% of covered lands) will have achieved, mature and late-seral conditions by 2048, providing secure, undisturbed habitat for gray wolves and prey species.

Although the majority of timber stands on covered lands will be allowed to mature over the term of the permit, some areas of younger forest and unforested habitats that provide forage for key prey species will continue to persist or maintained as a result of a commercial harvest. An undetermined amount of acres in the Conservation Zone will be managed as forage for ungulate populations and even-aged rotational-harvest practices in the Commercial Zone should also provide forage for these species on a continual basis. A portion of the no-harvest riparian buffers will also persist as hardwood stands and will continue to be used as forage by deer and elk. Tacoma's ownership is concentrated in the lower riparian areas of the upper watershed where deer and elk tend to congregate during the winter. No-harvest riparian buffers will ensure these areas remain unharvested and available for wintering deer and elk over the term of the HCP. Although not specifically designed to protect wintering elk and deer, these measure will reduce disturbance to wintering ungulates and provide additional foraging areas.

Disturbance Effects

In the Conservation Zone, stands less than 100 years of age will be subject to an uneven-aged harvest regime for the purposes of accelerating or enhancing the development of late-seral forest characteristics. Impacts to gray wolves typically associated with human use during harvest activities can be expected to occur in the Conservation Zone. Disturbance to habitat at least during the short-term can be expected as trees are harvested according to habitat conservation measure HCM 3-01C. Roads will also need to be constructed in order to harvest some of the Conservation Zone causing an increase in human disturbance during construction and use. It is anticipated that by leaving 50 or more dominant or co-dominant trees per acre harvested as required by HCM 3-01C that these areas will develop into a fully stocked stand of large trees

with a well developed understory by the time the stands reach 100 years old. Once theses stands reach 100 years of age no additional harvest will be conducted, unneeded roads will be abandoned, and harvest related disturbances will no longer occur. On average, no more than 2 percent (46 acres) of the coniferous stands in the Conservation Zone will be affected by humans disturbances during harvest in any year during the term of the HCP.

Under the HCP, Tacoma will manage 3,858 acres of their lands for commercial timber harvest. Excluding riparian buffers, non-vegetated areas, and UMAs, there are approximately 3,285 acres of the 3,858 acres available for commercial harvest. The objective of this zone is to grow and harvest timber commercially on a sustainable basis. These stands will be managed on a 70 year, even-aged rotation. Disturbance to gray wolves associated with timber harvest and associated road construction will occur in the Commercial Zone. Seasonal timing restriction and limits on the amount of habitat harvested annually (on average only 1.5 percent (49 acres)) will minimize harvest-related disturbances to wolves.

Human activity associated with silvicultural activities such as planting, pruning, thinning, salvage harvesting may disturb gray wolves. To avoid human-related disturbance to stands in the Natural Zone and Conservation Zone of older than 100 years, such activities will not be conducted in these areas. If these and other covered activities were determined to occur near a den site or first rendevous site, seasonal timing restrictions and long-term habitat protection measures would be implemented to ensure that denning gray wolves were not disturbed during critical times and that habitat near these sites would not be significantly altered.

Studies have shown gray wolves to colonize areas with mean road densities of 0.6 km/sq. km (Thiel 1985) and 0.7 km/sq. km (Fuller et al. 1992). In these studies road densities served as an surrogate for human disturbance. Gray wolves have been known to avoid areas near roads with high human use but, favor closed roads with little or no human use as travel lanes (Thurber et al. 1994). Road densities do not seem to be as important for gray wolf recovery as earlier thought and as long as gray wolves are not killed they appear to have the ability to occupy areas with greater human activity than previously assumed (Mladenoff et al. 1995). Adequate prey densities appear to be the main factor limiting gray wolves where they are present and tolerated by humans (Fuller et al. 1992). Road construction, management, and use on covered lands implemented according to the HCP could result in disturbance to wolves. Road densities on Tacoma's ownership are already considered high with respect to the needs of gray wolves and will stay the same or slightly decrease over the term of the HCP. Road densities on Tacoma's lands average 4.18 miles per square mile (2.7km/sq. km). The highest densities are in the Commercial and Conservation Zones averaging 5.47 and 5.57 miles per square mile, respectively. In the Natural Zone, road densities are considerably less at 2.11 miles per square mile (1.4 km/sq. km), but still considered high with respect to the needs of wolves.

Tacoma will continue to construct roads in all three zones of their ownership to facilitate watershed operations and forest management activities which could disturb gray wolves or lower habitat suitability. To minimize the amount of disturbance, Tacoma will implement seasonal

timing restrictions around dens and first rendevous sites. To minimize the potential for human-wolf interactions caused by roads, Tacoma will abandon roads on covered lands in other locations where they are no longer necessary. Tacoma has also committed to maintain locked gates in order to restrict public access to the upper watershed, reducing the disturbance of gray wolves due to frequent vehicle traffic and the potential that wolves will be accidentally or intentionally killed.

Injury/Death
Potential for direct injury or death of gray wolves is anticipated to be extremely low. Seasonal timing restrictions, road closures, access restrictions, and long-term habitat protection measures around dens and first rendezvous sites are anticipated to minimize the potential for direct take of wolves, although some mortality from gray wolf/car encounters may occur when or if gray wolves become established in the watershed.

Population-Level Effects
The FWS does not anticipate short-term reductions in the baseline of this species to result from the HCP, because the likelihood of incidental take due to habitat modification and disturbance on Tacoma lands under the provisions of the HCP are expected to be small. Gray wolves are not currently known to inhabit covered lands or the larger Green River Watershed and Tacoma has agreed to implement den site protection measures should gray wolves expand their range to include the Green River Watershed.

Throughout its 50 year term, the HCP is expected to have a net positive effect on gray wolves and contribute to improvements in its status both locally and regionally by increasing habitat function and quantity on covered lands and controlling access to the upper Green River Watershed. Late-seral and mature coniferous forest habitats will increase on Tacoma lands from its current 309 acres to 4,319 acres over the life of the HCP and 6,957 acres of 11,644 forested acres on covered lands will be managed for mature and late-seral conditions and not be subject to commercial harvest over the term of the HCP. This habitat will provide secure, undisturbed habitat for both gray wolves and important prey species.

Bald Eagle

Bald eagles are present year-round in the Green River Watershed. Both foraging and nesting habitat is available in the upper watershed at amounts that could support additional nesting pairs (USFS 1996). Winter roosts habitat is also present in the upper watershed and there are several bodies of water including HHD Reservoir that could provide foraging opportunities.

Mitigation and Minimization Measures
Minimization and mitigation measures for bald eagles include the establishment of mature and late-seral coniferous forest conditions in the Natural and Conservation Zones as well as in UMAs and riparian buffers capable of supporting nesting and roosting bald eagles. Coniferous forests in the Natural Zone, stands greater than 100 years old in the Conservation Zone, UMAs, and

riparian buffers will be allowed to continue successional development without intervention over the life of the permit. The remaining lands in the Conservation Zone will be managed to accelerate the development of late-seral and mature coniferous forest conditions to increase the amount of suitable habitat for bald eagles. Once these stands reach 100 years old, they will also be allowed to develop without further harvest. Covered lands in the Natural Zone adjacent to HHD Reservoir, the mainstem Green River, and major tributaries of the Green River will not be subject to harvest and will provide large tracts of suitable habitat adjacent to potential foraging areas.

Tacoma will retain no-harvest riparian buffers along all streams and wetlands within covered lands. No-harvest buffer widths will vary from 200 to 50 feet according to the size and type of stream or wetland. These buffers are expected to enhance and protect habitat for fish prey species, as well as, provide potential perching, roosting, and nesting trees throughout covered lands. In total, approximately 2,125 acres of potential nesting and foraging habitat will be protected by riparian buffers along streams with an additional but undeterminable amount around wetlands.

Tacoma will implement seasonal timing restrictions and long-term habitat protection measures around bald eagle nest and communal winter night roosts. Under seasonal timing measures, Tacoma will not conduct timber felling, yarding, road construction, or other habitat alterations within 0.25 mile (or within 0.50 mile along the direct line of sight), use of helicopters for commercial timber harvest and silvicutural activities with 0.50 mile, or blast within 1.0 mile of any known bald eagle nest from January 1 through August 31 or communal winter roosts from November 15 to March 15. Under long-term habitat protection measures, Tacoma will conduct no timber felling or other habitat alterations within 400 feet of any bald eagle nest or communal winter night roost.

Under the HCP, Tacoma will provide upstream passage of adult salmonids over their Headwork Diversion Dam and around HHD releasing fish above HHD Reservoir to spawn in the upper Green River Watershed. This is anticipated to result in self-sustaining runs of salmon and, in turn, provide an additional food source for bald eagles and other species closely associated with the salmonid life-cycle.

Primary Beneficial and Detrimental Effects

Habitat Effects

Considerable acreage of mature and late-seral forests capable of supporting bald eagle nesting and roosting is expected to be maintained or develop in the Natural and Conservation Zones as well as the UMAs and riparian buffers. Much of this habitat will develop adjacent to or near foraging areas such as HHD Reservoir and the mainstem Green River. Over the 50 year life of the HCP, the total amount of mature coniferous forest (106 to 155 years old) on Tacoma lands is anticipated to increase from 268 acres to 4,027 acres. In addition, the total amount of late-seral coniferous forests (>155 years old) is expected to increase from 41 acres to 292 acres. By permit expiration, 82 percent of the late-seral forest (238 of 292 acres) and 64 percent of the mature

forest (2,593 of 34,027 acres) will be in the Natural Zone. Eight percent (19 acres) of late-seral forest and 29 percent (1,161 acres) of mature forest will be in the Conservation Zone. The remaining 13 percent (39 acres) of late-seral and 7 percent (272 acres) of mature forest will be contained in UMAs and riparian buffers. In total, approximately 6,957 acres will be managed for, and 4,319 acres (29% of covered lands) will have achieved, mature and late-seral conditions by 2048 that provide suitable nesting and foraging habitat for bald eagles. Habitat that develops in these designated zones will be protected from harvest during the term of the HCP

A similar amount of habitat would be available for bald eagle communal winter night roosts. Communal roosts stands are generally uneven-aged stands with a multi-layered canopy. Roosts are typically established in isolated areas in old growth stands that have larger trees than the surrounding trees (WDFW 1991). Both habitat conditions exist on Tacoma's ownership and will expand in acreage over the term of the permit. The Natural Zone will continue to develop old forest characteristics under a no-harvest scenario, and the Conservation Zone is being specifically managed to provide uneven-aged stands with a dominant overstory and multi-layered canopy. Both the Natural and Conservation Zones are in close proximity to the Green River and HHD Reservoir. Reestablishment of anadromous fish to these water bodies would enhance the suitability of the surrounding habitat for wintering bald eagles by increasing the forage base.

Disturbance Effects

Some disturbance of bald eagles is anticipated as a result of implementing the HCP. Primary activities that could result in disturbance and potentially lead to take of bald eagles include uneven-aged harvest activities in stands in the Conservation Zone, even-aged harvest in the Commercial Zone, road management and use including road abandonment and decommissioning, and other silvicultural activities such as planting, pruning, thinning, salvage harvesting, and hardwood conversion.

In the Conservation Zone, stands less than 100 years of age will be subject to an uneven-aged harvest regime for the purpose of accelerating or enhancing the development of late-seral forest characteristics. Stands eligible for harvest in the Conservation Zone and adjacent stands are not known to currently contain nesting bald eagles or communal winter night roosts, but comprehensive surveys in the watershed have not been completed for bald eagles. Consequently, some disturbance to unknown bald eagles sites in the Conservation Zone or adjacent habitats may occur during harvest of some stands in the Conservation Zone. It is anticipated that these disturbances will be short-term in nature and would not likely diminish the suitability of the Conservation Zone or adjacent habitats. To minimize the amount of disturbance that may result from harvest of stands in the Conservation Zone, seasonal timing restrictions described previously will be implemented when nesting or roosting bald eagles are present. In addition, the management goal in the Conservation Zone is to enhance or accelerate the development of mature and late-seral forest conditions that would provide habitat for bald eagles. Over the 50 year term of the HCP, an average of no more than 2 percent (46 acres) of the coniferous stands in the Conservation Zone will be harvested in any year.

Under the HCP, there are approximately 3,285 acres of the 3,858 acres available for commercial harvest. The objective of this zone is to grow and harvest timber commercially on a sustainable basis. These stands will be managed on a 70 year, even-aged rotation. Forest stands eligible for harvest in the Commercial Zone contain habitat suitable for nesting bald eagles or as communal winter night roosts. There are currently acres of coniferous forest 76 to 105 years old and 97 acres of coniferous forest 106 to 155 years old in the Commercial Zone. Over the term of the HCP, stands in the 76 to 105 years old age class will decrease to 50 acres while stands in the 106 to 155 years old age class will increase to 268 acres with an addition 39 acres exceeding 155 years of age. Because habitat will simultaneously be developing in riparian buffers and UMAs in the Commercial Zone, there will be a net decrease of approximately 346 acres of suitable habitat in the Commercial Zone over the 50 year term of the HCP. Losses in habitat are expected to be off-set by the overall gain in forests of 106 years old or older from 309 acres to 4,319 acres. To minimize the amount of disturbance that may result from the even-aged harvest of stands in the Commercial Zone, seasonal timing restrictions described previously will be implemented when nesting bald eagles or communal winter night roosts are present. On average only 1.5 percent (49 acres) of the Commercial Zone will be harvested in any year during the HCP term and no harvest unit will exceed 40 acres in size. This will minimize the amount of habitat removed annually and the amount of disturbance associated with harvest related activities.

Other silvicultural activities such as planting, pruning, thinning, salvage harvesting and hardwood conversion are not anticipated to have a significant disturbing effect on bald eagles. Salvage harvesting under the HCP will not occur in stands (Natural Zone and stands in the Conservation Zone of 100 years old or older) that are currently capable of supporting nesting and roosting bald eagles. Activities such as planting, pruning, thinning, and hardwood conversion typically occur in areas not suitable as nest sites or winter roosts for bald eagles. If such activities were determined to occur in or near habitat that supported nesting or roosting bald eagles, seasonal timing restrictions and long-term habitat protection measures would ensure that nesting bald eagles and communal winter roosts were not disturbed and habitat near these sites were not significantly altered.

Road construction, management, and use implemented according to the HCP could, in some instances, result in disturbance to bald eagles. Tacoma will continue to construct roads in all three zones of their ownership to facilitate watershed operations and forest management activities. In addition to seasonal timing measures and long-term protection of nest and winter roost sites, Tacoma will remove unnecessary roads and will cause no net increase of roads in the Natural Zone. In addition, Tacoma has also committed to maintaining locked gates to restrict public access to the upper watershed, thereby reducing the disturbance of bald eagles due to frequent vehicle traffic.

Injury/Death

Potential for direct injury or death of bald eagles is anticipated to be extremely low. Under the HCP, Tacoma has committed to protecting and increasing the amount of suitable habitat for bald eagles on its ownership. Although some potential habitat may be lost in the Commercial Zone,

no direct take is expected to occur because of it. Seasonal timing restrictions and long-term habitat protection around nests and communal winter night roosts are anticipated to minimize the potential for direct take of bald eagles.

Population-Level Effects
The FWS does not anticipate short-term reductions in the baseline of this species to result from the HCP, because the likelihood of incidental take due to habitat modification and disturbance on Tacoma lands under the provisions of the HCP is expected to be rare. To accomplish this, Tacoma under terms of the HCP, is expected to protect all existing active bald eagle nest sites and communal winter night roosts, implement seasonal timing restrictions for covered activities, grow additional habitat over the life of the HCP, and reintroduce salmonid stocks to the upper Green River Watershed.

Throughout its 50 year term, the HCP is expected to benefit bald eagles and contribute to improvements in its status both locally and regionally. Increases in habitat function and quantity and the reestablishment of self-sustaining salmon stocks in the upper watershed can accommodate an increase in population size and improve productivity on covered lands and in the upper Green River Watershed. Late-seral and mature coniferous forest habitats will increase on Tacoma lands from the current 309 acres to 4,027 acres over the life of the HCP. Increases in these forest habitat types and the reintroduction of salmon could potentially lead to increases in the population of bald eagles at the local level and have positive effects on the regional population.

Bull Trout/Dolly Varden

Because bull trout and Dolly Varden are difficult to distinguish from one another and they have similar life history traits and habitat requirements, Tacoma is seeking incidental take coverage for both species and the effects of the HCP on both will be addressed jointly in this document and referred to as bull trout or native char. The US Forest Service (USFS) (USFS 1996) and Plum Creek Timber Company (Watson and Hillman 1997) have both conducted surveys for bull trout in the upper Green River Watershed and have not observed any during their efforts. If bull trout were present in the upper Green River Watershed above HHD, they would likely be fluvial or resident life history forms. It is unlikely that adfluvial forms could reside year-round in HHD Reservoir due to extensive seasonal draw downs by the COE for flood control purposes.

There is some historical evidence that native char have occurred in the Green/White River system in the 1800s. The White River was disconnected from the Green River and diverted into the Puyallup River in 1906. The White River supports a population of approximately 500 adult bull trout (C. Scafidi, FWS, pers. com.), while the lower and middle Green River have had only scattered observations following the diversion of the White River. A single bull trout was observed in Soos Creek in 1956 (Beak 1996) and another observation in 1994 was near the mouth of the Duwamish River (63 FR 31693). The most recent information is an observation of 8 native char that were found in the Duwamish Turning basin near RM 1.5 in August and

September of 2000 (Taylor Associates 2001).

Bull trout in the lower and middle Green River would likely be anadromous. Habitat degradation and warm water temperatures are believed to limit the distribution of bull trout in drainages such as the lower Green River and its tributaries, and likely prevent self-sustaining population from occurring (Goetz 1989; Rieman and McIntyre 1993; McPhail and Baxter 1996).

Bull trout populations in Puget Sound have been negatively impacted by past forest-management practices, and continue to experience negative effects from past management practices including road construction and maintenance. Logging and associated activities can adversely impact bull trout habitat in a number of ways, including reducing stream shading and channel stability, elevating fine sediments in spawning gravels and filling in substrate interstices, reducing pool habitat, altering nutrient balance and physical character of the stream, reducing cover and overall habitat complexity, and restricting natural movements of juvenile and adult salmonids (Spence et al. 1996). Harvest of riparian areas often increased bank erosion and sediment delivery in forested watersheds such as the Green River. Since implementation of best management practices and state regulations requiring riparian buffers, logging roads and not necessarily timber felling and yarding are believed to be responsible for the majority of fine sediment that enters aquatic systems (Everest et al. 1987). Bull trout may be more susceptible to the negative effects of logging and associated road construction, use, and maintenance than other salmonids because of their requirements for cold, clean water and their relatively long egg to fry maturation.

Minimization and Mitigation Measures

Tacoma will provide up-stream fish passage at their diversion facility around HHD for bull trout and Dolly Varden, should they occur, releasing them above HHD Reservoir to allow access to spawning habitat in the upper Green River Watershed. Tacoma has also committed to maintaining minimum instream continuous flow in the Green River during summer periods as measured at the Auburn gage. Under Tacoma's First Diversion Water Right claim, during wet years Tacoma has committed to maintain 350 cfs at the Auburn gage. During wet to average years, Tacoma will maintain 300 cfs during the summer period. During average to dry years, Tacoma will be required to maintain flows of 250 cfs and during drought years, Tacoma will maintain at least 225 cfs at the Auburn gage (see HCM 1-01 in the HCP). Before withdrawing water under their Second Diversion Water Right, Tacoma will also adhere to seasonal minimum instream flows at the Palmer and Auburn gages. Tacoma will not exercise the Second diversion Water Right if flows are less than 200 cfs from July 15 to September 15 and 300 cfs from September 16 to July 14 as measured at the Palmer gage. During the period of July 15 to September 15, Tacoma will also not exercise the Second Diversion Water Right when river flows are less than 400 cfs at the Auburn gage (see HCM 1-02 in the HCP).

Tacoma will retain no-harvest riparian buffers along all streams on covered lands. No-harvest buffers widths will vary according to stream type. No-harvest riparian buffers on WDNR Stream Types 1 and 2 will be 200-feet wide. No-harvest buffers on Type 3 streams will be 150 feet wide. No-harvest riparian buffers Type 4 streams will be 50 feet wide and expand out to 100 feet

at key locations. These locations are at the origin of Type 4 streams, at headwalls and along steep and unstable slopes, at confluences with other Type 4 streams, at the confluences of Type 4 streams with fish-bearing streams, around springs and seeps, and along low gradient reaches. No-harvest riparian buffers on Type 5 streams will be 25 feet wide. In addition, the HCP requires partial-harvest riparian buffers of 50 feet on Type 3 streams and the 25 feet on Type 5 streams. These buffers are in addition to and upland of the no-harvest buffers required for these stream types. When conducting partial harvest on Type 3 stream buffers, Tacoma has agreed under the HCP to leave the largest 70 coniferous trees per acre. On Type 5 streams, Tacoma has committed to retaining the largest 50 coniferous trees per acre. All buffers widths will be measured horizontally on both sides of the stream from the ordinary high water mark, channel migration zone, or channel disturbance zone whichever is greater.

To reduce impacts of sediment from road construction and maintenance Tacoma will: 1) participate in Watershed Analysis, 2) participate in the development and implementation of a Road Sediment Reduction Plan, 3) implement mass wasting prescriptions from Watershed Analysis for all new road construction, 4) use full bench construction with no side-casting of material on all side slopes greater than 60 percent, 5) mulch and seed all road cuts, 6) maintain locked gates to restrict road access, 7) abandon all roads that are no longer needed for watershed management, forestry, or HCP implementation, 8) replace all culverts that block fish passage, and 9) discontinue heavy truck traffic when there is a potential for excessive road damage or water quality impacts that would adversely affect fish.

Primary Beneficial and Detrimental Effects

Habitat Effects

Riparian vegetation provides six specific functions that are essential to the development and maintenance of aquatic habitat favorable to bull trout. Riparian vegetation provides shade to stream channels, contributes large woody debris to streams, adds small organic matter to streams, stabilizes streambanks, controls sediment inputs from surface erosion, and regulates nutrient and pollutant inputs to streams (Spence et al. 1996). The removal of riparian vegetation through logging can diminish these important functions resulting in unfavorable conditions for salmonids and subsequent declines in some populations. Riparian buffering is generally accepted as the most effective way to protect aquatic and riparian habitats (Cummins et al. 1994) and their associated functions. The effectiveness of buffer widths can be best evaluated within the context of specific protection goals (Spence et al. 1996). To provide adequate protection for bull trout, riparian buffers must be of sufficient width to encompass the functions identified above and provide for clear, cold water with complex, connected habitat. Each of these functions have been linked to different buffers widths and the amount of supporting literature associating buffer widths to a particular function is variable.

Stream shading has generally been well studied and some of the most thorough studies of the effectiveness of riparian buffers and shading have been conducted in the coastal and Cascade ranges of the western U.S. (Spence et al. 1996). Brazier and Brown (1973) found that canopy densities comparable to old growth densities (80% to 90% closure) could be achieved with

riparian buffers of 22-30 meters wide (72 - 98 feet). Another study in the western Cascades suggests that riparian buffers greater than 38 meters (125 feet) retain 100 percent of natural shading in coniferous forests (Steinblums et al. 1984). FEMAT (1993) curves suggest that 100 percent shade is achieved at distances of between 25 meters and 39 meters (82 - 128 feet) depending on the height of a site potential tree. Other authors have suggested similar distances for buffers to achieve adequate shading for stream in the coastal and Cascade regions (Murphy 1995, Johnson and Ryba 1992, Beschta et al. 1987). Covered lands in Tacoma's HCP fall within this geographic area thus buffer widths necessary to provided adequate shade are assumed to be comparable. Buffer widths that will be implemented by Tacoma on similar streams on covered lands will measure 200 feet on a side.

Most of the literature concludes that a majority of the large woody debris entering a stream channel originated from a distance equal to a site potential tree height from the channel margins (Spence et al. 1996). FEMAT (1993) curves indicate that almost all of the large woody debris delivered to an active stream channel comes from one site potential tree height or less. Murphy and Koski (1989) found that 99 percent of all identified sources of large woody debris were within 30 meters from the stream bank (98 feet) for forests in southeastern Alaska. One study conducted in Washington and Oregon identified sources of large woody debris coming from as far way as 50 meters (164 feet) in mature stands and 55 meters (180 feet) in old growth forests (McDade et al. 1990). A review of the literature by Cerderholm (1994) showed that recommendations for buffer widths to maintain recruitment of large woody debris ranged from 30 to 60 meters (98-196 feet). Buffer widths that will be implemented by Tacoma on similar streams on covered lands will measure 200 feet on a side.

Literature identifying buffer widths necessary to provide sufficient amounts of fine organic litter and to make streambanks less susceptible to erosion is not abundant (Spence et al. 1996). FEMAT (1993) assumes that most fine organic matter originates from the first 30 meters (98 feet) of a stream or a distance equivalent to approximately 0.50 of a site potential tree height. Buffers may need to be wider depending on the composition of vegetation adjacent to the stream, but it is generally thought that buffers large enough to maintain 100 percent of large woody debris recruitment and 100 percent of natural shade are also likely to provide approximately 100 percent of fine organic matter (Spence et al. 1996). Spence et al. (1996) also concluded that buffer widths adequate to protect other riparian functions such as large woody debris recruitment and shading are also adequate to provide for stable streambanks. FEMAT (1993) curves indicate that a buffer width equivalent to 0.50 of a site potential tree provides most of the riparian root structure necessary for stable streambanks. Buffer widths that will be implemented by Tacoma on similar streams on covered lands will measure 200 feet on a side.

The ability of riparian buffers to control sediment inputs from surface erosion and to take up nutrients and other dissolved material are well studied, but not as clearly understood as the other riparian functions. This lack of understanding of these functions have led to riparian buffer recommendations that are extremely variable and reflective of site-specific conditions and the make-up of the sediment and nutrient inputs (Spence et al 1996). For sediment retention, buffer

recommendations range from 3 meters to 122 meters (10-400 feet) for agricultural lands (Wilson 1967, Belt et al. 1992), but are somewhat less for forest lands ranging from approximately 15 meters to 90 meters (50-295 feet)(Broderson 1973, Lynch et al. 1985, Belt et al. 1992). FEMAT (1993) maintains that buffer equivalent to one site potential tree height is probably adequate to control sediments from overland flow. Similar variation can be observed in studies investigating the up-take of nutrients by riparian buffers. Some evidence indicates that land use can play a major role in determining buffer widths required for the up-take of nutrients (Spence wt al 1996), but existing studies have not provided adequate information for determining effective buffer widths (Belt et al. 1992). A literature review by Spence et. al. (1996) suggested that for most forest lands, buffers designed to protect other riparian functions (large woody debris recruitment, shading) are probably adequate for controlling nutrient inputs to the degree that such increases can be controlled by riparian buffers. For comparison, buffer widths that will be implemented by Tacoma on similar streams on covered lands will measure 200 feet on a side.

Riparian management measures implemented under Tacoma's HCP exceed riparian buffer widths required by state forest practices rules recently modified by the Forests and Fish Report (FWS et al. 1999) and are generally greater than buffer widths recommended in the literature to achieve properly functioning stream habitats (Spence et al. 1996). Under state forest practices rules, Types S (shorelines of the State) and Type F (waters containing fish habitat other than Type S waters) receive no-harvest buffers of 50 feet (core zone) with partial harvest buffers in the inner and outer zone out to about 150 feet. Tacoma's HCP requires no-harvest buffers of 200 feet on Type 1 and 2 streams and 150 feet on Type 3 streams. Type 3 streams on Tacoma's lands will also receive a 50-foot partial-harvest buffer beyond the 150-foot no-harvest buffer. Type 1, 2, and 3 streams are equivalent to Type S and F waters. Under Tacoma's HCP, the effective buffer width in the Natural Zone will be greater because the entire zone is no-harvest.

Perennial and seasonal non-fish streams (Type 4 and 5 under the HCP and Type N under forest practices rules) receive more protective buffers under Tacoma's HCP than similar waters would receive under state forest practices rules. Type 4 streams or perennial Type N streams receive 50 to 100 foot no-harvest buffers under Tacoma's HCP. Under forest practices rules, the same streams would receive a 50-foot no-harvest buffer over approximately 50 percent of their lengths. Type 5 streams or Type N seasonal streams under Tacoma's HCP receive 25 foot no-harvest and 25 foot partial-harvest buffers. Similar streams under state forest practices rules may not be buffered at all unless steep and unstable slopes are present. The effective buffer width along Type 4 and 5 streams in the Natural Zone will be greater because the entire zone is no-harvest.

In addition to buffer width, the age of stands encompassed by the buffer is important to determine when suitable habitat conditions generally associated with bull trout streams could be achieved. Currently, riparian stands on Tacoma lands range from as young as 6 years old to over 155 years old, with roughly 50 percent of the stands being 55 years old or less. By 2048 it is projected that all riparian areas will be 55 years of age or older, with 4 percent of these areas exceeding 155 years old. A total of 2,125 acres of covered lands will be protected by no-harvest riparian buffers.

The trap and haul facility to be constructed at the Tacoma's Headworks Dam will allow bull trout that may migrate upstream to be captured and released into the upper watershed above HHD. This will allow any bull trout captured and released access to the upper Green River Watershed (45% of the entire Green River basin) previously blocked since 1913. Habitat conditions in the upper watershed are more favorable for spawning of adult bull trout and the rearing of juveniles than habitat in the lower and middle Green River.

Disturbance Effects

If bull trout are present in the Green River below Tacoma's diversion facility (RM 61.0), the migration of adult bull trout will likely not be prevented by Tacoma's water withdrawals and the associated guaranteed minimum flows at the Auburn and Palmer gages committed to in HCM 1-01 and 1-02. Although the flow commitments were not established for migrating bull trout specifically, they are anticipated to be adequate because these flows were considered sufficient for upstream passage of chinook salmon which spawn during the same late summer to early fall time period. Adult chinook salmon are larger than bull trout and require greater water depths to move upstream over riffles. Based on data collected at riffles in the lower river during the State's instream flow study, water depths in the Green River were determined to be sufficient for upstream passage of chinook when flows at the Auburn gage exceeded 225 cfs. Guaranteed flows under HCM 1-01 will not fall below 225 cfs, and during average and wet years minimum instream flows at the Auburn gage will be 250 and 300 cfs, respectively. Based on the ability of chinook salmon to navigate the Green River when flows at the Auburn gage exceed 200 cfs, it is appropriate to assume that these flows are also adequate for migrating bull trout. Flows to be maintained under the HCP are also higher than minimum flows established by the Washington Department of Ecology (WAC 173-509).

The Tacoma's Headworks facility has prevented the upstream migration of bull trout above RM 61.0 since 1913. The number of bull trout actually prevented from accessing the upper Green River Watershed is unknown. The upstream trap-and-haul facility to be installed at the Headworks diversion dam under HCM 1-03 will provide upstream passage over Tacoma Headworks Diversion and around HHD for any bull trout that reach the Headworks facility during their spawning migration. Since fish will be collected in a trap and transported around HHD by truck, there is a potential for fish to be harmed and possibly killed during this process. The trap and haul facility will be designed to minimize handling and transportation stress to bull trout. Water to water transfer will be used to move fish from the trap to the truck to minimize human handling of fish. The vehicle used to transport the fish will also be specifically designed to minimize human handling of fish. The specific design criterial for the facility and truck will be developed in coordination with the Services as well as state and tribal interests to ensure disturbance to bull trout and salmon will be minimized.

The downstream passage of bull trout at the Headworks facility could potentially harm out-migrating adult and juvenile bull trout. Two routes are currently available to fish migrating downstream over Tacoma's Headworks. The safest of theses two alternatives has been over the existing Headworks facility which is 17 feet high and 150 feet wide. The height of this facility does not alone present a risk to fish passage, but some injury to fish may occur during certain

flows because of the condition of the substrate and channel configuration below the Headworks. One study funded by the COE shows that provided fish fall into water, small fish (<100 mm) suffer almost no mortality from falls of up to100 feet and larger fish (>300 mm) do not begin to experience mortality until the height of the fall is over 50 feet (R2 1998). The new Headworks facility will be an additional 6.5 feet high, for a total of 23.5 feet in height and a total of 220 feet wide. The additional height and width are also not anticipated to result in an increased risk of injury or mortality to fish, provided the conditions of the substrate below the Headworks are suitable to prevent injury and adequate water exists (R2 1998). Under HCM 1-04, the channel and landing below the Headworks will be reconfigured to provide a suitable landing pool and adequate water depth that will minimize the effects of the new 23.5 foot fall over the Diversion dam. The specifics surrounding the design of the channel below the Headworks will be developed in coordination with the Services as well as others to ensure injury to bull trout and salmon will be minimized.

Alternatively, fish may pass through the Headworks intake. The existing intake screens do not meet current screening standards and may entrain or impinge fish. The Headworks intake currently has a greater potential to result in the mortality of fish as compared to passage over the Diversion dam. Under HCM 1-04, the new Headworks will incorporate a non-revolving wedgewire screen with trash racks, downstream fish by-pass system, and dual slide gates that will comply with NMFS screening criteria and significantly reduce the risk of entrainment and impingement of fish. The Services will be involved in the final designs of the diversion dam, screens, and fish by-pass system. This measure, including subsequent monitoring, would minimize take associated with the operation of the intake prior to the development of a HCP.

Tacoma's forestry activities in the upper watershed may also adversely affect bull trout. Roads accelerate soil erosion rates because of surface erosion and mass soil movements such as slumps and earth flows, debris avalanches, debris flows, and debris torrents. High rates of stream sedimentation result from this increased erosion. Furniss et al. (1991) found soil erosion rates were 30 to 300 times higher on forests with roads than undisturbed forest. Roads also altered stream-flow rates and volumes, which along with increased sedimentation, resulted in altered stream channel geometry (Furniss et al. 1991). Acting as new flow paths for water, roads increased the channel network over watersheds, increasing the drainage density. Roads have also increased the frequency and magnitude of debris flows, negatively affecting the long-term potential for developing complex channel morphology and aquatic habitat. Shifts in sediment loads set off a complex of channel responses including changes in pool volumes, depth and frequency, and changes channel morphology (including slope, sinuosity, shape, velocity, flooding regime, and sediment transport) (Rhodes et al. 1994).

Roads can also degrade fish habitat by creating migration barriers such as inadequate culverts and temporary blockages caused by road induced landslides. Erosion results in sedimentation of streams and causes declines in spawning habitat when too high a proportion of fine sediment is deposited. Hicks et al. (1991) found that salmonid survival rates decreased after logging and road construction as fine sediment levels in streams increased and as important habitat characteristics, including the number of pools and winter cover, decreased. Macro-invertebrates,

the primary food source of juvenile fish, also typically decline when large amounts of sediment are added to the stream system (Furniss et al. 1991).

The introduction of sediment in excess of natural amounts can have multiple adverse effects on channel conditions and processes resulting in effects on bull trout survival, the food web, and water quality conditions, such as water temperature and dissolved oxygen (Rhodes *et al.* 1994). Fine sediments can influence incubation survival and emergence success (Weaver and White 1985) but may also limit access to substrate interstices that are important cover during rearing and overwintering (Goetz 1994; Jakober 1995). Emergence success of bull trout has been shown to be approximately 80 percent when no fine materials are present, and approximately 30 percent when 35 percent fine materials are present (Weaver and White 1985 in Montana Bull Trout Scientific Group 1998). Bull trout at all life stages occupy deep pools and few bull trout are found in streams where pools are lacking (Dambacher et al. 1992; Buckman et al. 1992 and Goetz 1989 in MBTSG 1998). Shifts in sediment loads set off a complex of channel responses including changes in pool volumes, depth and frequency, and changes in channel morphology (including slope, sinuosity, shape, velocity, flooding regime, and sediment transport) (Rhodes *et al.* 1994; Castro and Reckendorf 1995).

To minimize the adverse effects of roads and road use, Tacoma will implement several conservation measures aimed at reducing the amount of sediment entering streams and the HHD Reservoir. Tacoma will contribute funds and participate in the development of a Road Sediment Reduction Plan describing the priorities and schedule for road maintenance, improvement, and abandonment activities that will be implemented to reduce road sediment inputs to less than 50 percent of the estimated background sediment production rates as determined by Watershed Analysis. Within two years of the Permit issuance, Tacoma will prepare and prioritize plans to abandon unnecessary existing roads and within five years Tacoma will complete the abandonment of the roads identified. Within two years, Tacoma will inventory all roads on Tacoma lands to identify and prioritize removal of all artificial barriers that block fish passage. Within five years of the issuance of the Permit, Tacoma will correct the identified blockages and restore fish passage.

Tacoma will implement prescriptions developed by Watershed Analysis specific to the construction of new temporary and permanent roads. When constructing roads on side slopes greater than 60 percent, Tacoma will use full bench construction with no side-casting of excavated material. Tacoma will place mulch and grass seed on all road cuts with slopes greater that 40 percent near water crossings, as well as in all locations where there is the possibility of severe erosion or slumping above the road. Where Tacoma has control over road use, they will maintain locked gates to restrict road use by the general public and will also discontinue heavy truck traffic under its control when there is a potential for extraordinary damage to the road or excessive impacts to water quality. Where stream crossing are necessary, Tacoma will: 1) minimize the right-of-way crossing, 2) cross streams and riparian corridors at right angles, 3)

minimize disturbance to the natural flow, 4) minimize side-casting of excavated material, and 5) provide for upstream and downstream passage of fish if reaches are fish bearing. These measures combined with riparian buffers are anticipated to substantially reduce sediment delivery to non-fish and fish-bearing stream as well as the reservoir.

Disturbances associated with logging-related increased sediment loads have been documented to require decades to pass the sediment through a watershed (Madej 1978, 1982 in Montgomery and Buffington 1993). Coarse sediment is expected to be deposited within a meander or two of the Plan site. Sand and silt is expected to travel in high flows and to be deposited within one to two miles after reaching the confluence with the next equal or higher order stream. Fine silt and clay will eventually be carried all the way to the estuary. Sediment from road construction and reconstruction is significant and tends to be of moderate to long duration, depending on geology, slope, and use. Interstial spaces for juvenile bull trout, side-channel and backwater habitat for juvenile and adult bull trout, deep pools for overwintering and migrating adults, egg survival, prey base abundance, and bull trout feeding activities can all be affected by sediment transport and deposition. All life history stages of migratory bull trout could be negatively impacted. Buffer widths prescribed for fish-bearing streams on covered lands should minimize effects of sediment delivery from logging occurring outside conservation areas.

One-hundred-foot buffer strips on each side of a stream's channel migration zone are typically stated as the minimal size needed to buffer most adverse effects of logging on streams (Hall and Lantz 1969; Moring 1975; Erman et al. 1977), and may not be adequate for adverse effects due to roads. Everest et al. (1987) found that logging roads, not the harvesting practice itself (unless both sides of a stream bank were clear-cut), were responsible for a large percentage of the sediment that enters an aquatic system. The channel network is increased by roads, because the roads act as tributaries, creating a more efficient sediment delivery system (Castro and Reckendorf 1995). Buffer widths prescribed for fish-bearing streams for covered lands will be a minimum 200-ft width. Partial harvest activities will only be allowed adjacent to the smallest fish bearing streams (Type 3) and only the outer 50 feet of the buffer will be subject to such harvest. During harvest, the largest 70 trees per acres will be retained. The buffers are expected to minimize sediment delivery to stream in the upper Green River Watershed and HHD reservoir.

Riparian and in-stream habitat conditions for fish-bearing streams on covered lands will improve under the HCP, and those improvements will continue to develop through the permit term. Riparian protections committed to in the HCP should lead to less streambed aggradation, less streambed sedimentation and more LWD in the mainstem rivers. Road management program under the HCP should lead to improving stream channel conditions and water quality. All of these measures combined should lead to lower levels of stream sedimentation in fish-bearing streams and less mass wasting events triggered by roads and logging practices.

Injury/Death

Potential for direct injury or death of bull trout is anticipated to be low under the HCP. Flows and riparian buffers widths provided for under the HCP are considered to be adequate and management-related sediment inputs will be reduced. Flows in the middle and lower Green

River are adequate for chinook and buffers widths are equal or greater than those considered adequate for salmonids. Bull trout could potentially be caught in the trap and haul facility and transported above HHD. Disturbance is anticipated to occur during this process, and such activity may also lead to the injury or death of an undetermined number of bull trout. Take resulting from the construction and operation of upstream and downstream passage facilities at Tacoma's Headworks is expected to be minimized through proper design and monitoring to ensure the facilities are not harming or killing fish. The transport truck will also be designed and operated to minimize the handling of fish, and monitored to ensure it is performing properly and not harming or killing fish.

Population-Level Effects

The FWS anticipates that there will be no reduction in the baseline of this species as a result of implementing of the HCP. Take is expected to be minimized through the overall design of the trap and haul facility and transport truck and as a result of riparian habitat growth and protection. The population may benefit from some bull trout access to the upper watershed. Suitable spawning habitat does not likely exist in the lower and middle Green River, but likely occurs above HHD. Reestablishing bull trout above the dam would increase local populations and expand the known range of the Puget Sound DPS.

Canada Lynx

The Canada lynx are the rarest of Washington's three cat species, with at most 200, and perhaps fewer than 100, individuals living in the state (WDFW 2000). Canada lynx were trapped and hunted in Washington as late as 1991. Canada lynx were listed as a state threatened species in 1993, and subsequently listed by the FWS as threatened in March of 2000. Over-exploitation of Canada lynx and the fragmentation of Canada lynx habitat contributed to its decline (WDFW 2000) at the state level.

Minimization and Mitigation Measures

Minimization and mitigation measures for Canada lynx include the protection and establishment of mature and late-seral coniferous forest conditions in the Natural and Conservation Zones as well as in UMAs and to a lesser extent riparian buffers. Coniferous forests in the Natural Zone, stands greater than 100 years old in the Conservation Zone, UMAs, and riparian buffers will be maintained and allowed to develop without intervention over the life of the permit, while the remaining lands in the Conservation Zone will be managed to accelerate the development of late-seral and mature coniferous forest conditions. No timber harvest will occur once these stands reach 100 years old. This will allow stands to develop mature and late-seral conditions through natural succession required by Canada lynx for denning, and travel between denning and foraging areas.

Tacoma will also implement seasonal restrictions around active Canada lynx dens and potential denning habitat. For the purposes of the HCP, potential Canada lynx denning habitat is defined as areas above 3,500 feet elevation, with dead and downed logs, and adjacent to or near Canada lynx foraging habitat. These seasonal restrictions will prevent timber felling, yarding, road

construction, the use of helicopters for commercial timber harvest and silvicutural activities and blasting within 0.50 mile of any known active Canada lynx den or potential denning habitat from May 1 to July 31.

Primary Beneficial and Detrimental Effects

Habitat Effects

Canada lynx require two structurally different types of habitat occurring at opposite ends of stand age gradient. They require early-successional forests described as 10-30 years old (Interagency Lynx Committee 1999) with abundant prey and late-successional forest with logs for denning and rearing kittens (Ruggiero et al. 1994). Tacoma lands provide both of these habitat types and both will persist over the 50 year term. Because Tacoma is managing for mature forest conditions the amount of late-successional forest will increase from 309 acres to 4,319 acres and the amount of early-successional forest will decrease from 2,363 acres to 1,353 acres. Considering the relatively small amount of lands Tacoma owns in the upper watershed and the relatively large home range of Canada lynx (Ruggiero et al. 1994), it is likely that any habitat provided by Tacoma lands would only make up a small portion of what would be needed to support Canada lynx. In addition, Tacoma lands are typically situated lower in the watershed. Weaver and Amato (1999) found that Canada lynx in Washington utilize habitat higher in elevation ranging from 3,400 to 5,600 feet with an average elevation of 4,889 feet. Less than 3 percent (255 acres) of Tacoma lands occurs above 3,000 feet. Therefore, even though many of Tacoma's management approaches (i.e. Natural Zone, no-harvest riparian buffers, den site protection) may be beneficial to Canada lynx, the effects are expected to be negligible.

Disturbance Effects

Primary activities that could result in disturbance and potentially lead to the incidental take of Canada lynx include uneven-aged harvest activities in stands in the Conservation Zone, even-aged harvest in the Commercial Zone, and road management and use including road abandonment and decommissioning.

In the Conservation Zone, stands less than 100 years of age will be subject to an uneven-aged harvest regime for the purposes of accelerating or enhancing the development of late-seral forest characteristics. It is anticipated that these disturbances will be short-term in nature and would not likely diminish the suitability of the stands for Canada lynx. To further minimize the amount of disturbance that may result from harvest of stands in the Conservation Zone, seasonal timing restrictions described previously will be implemented at known den sites and potential denning habitat. No more than 2 percent (46 acres) of the coniferous stands in the Conservation Zone will be harvested in any year. Only 10 acres of the Conservation Zone are above 3,000 feet.

Under the HCP, Tacoma will manage 3,858 acres of their lands for commercial timber harvest. Only 65 acres of the 255 acres of covered lands that occurs above 3,000 feet elevation is in the Commercial Zone, and are subject to disturbances related to the commercial harvest of timber. To minimize the amount of disturbance that may result from harvest of stands in the Commercial Zone, seasonal timing restrictions described previously will be implemented at known den sites and potential denning habitat. On average, only 1.5 percent (49 acres) of the Commercial Zone

will be harvested in any year during the HCP term minimizing the amount of disturbance related to timber harvest during any year.

Road construction, management, and use implemented according to the HCP could, in some instances, result in disturbance to Canada lynx. Tacoma will continue to construct roads in all three zones of their ownership to facilitate watershed operations and forest management activities. Tacoma will remove unnecessary roads and will cause no net increase of roads in the Natural Zone where habitat for Canada lynx is most likely to currently occur and develop over the term of the HCP. In addition, Tacoma has also committed to maintain locked gates to restrict public access to the upper watershed, thereby reducing potential negative effects associated with high densities of open roads.

Injury/Death

The potential for direct injury or death of Canada lynx is anticipated to be extremely low. The watershed will be closed to the general public and seasonal restrictions will be implemented around both active dens and potential denning habitat, reducing the potential for direct mortality of Canada lynx is considered to be highly improbable.

Population-Level Effects

The FWS does not anticipate short-term reductions in the baseline of Canada lynx to result from the HCP, because the likelihood of incidental take due to habitat modification and disturbance on Tacoma lands under the provisions of the HCP are expected to be rare. Canada lynx are not currently known to inhabit covered lands or the larger Green River Watershed.

Throughout its 50 year term, the HCP is expected to have a net positive effect on Canada lynx and contribute to improvements in its status both locally and regionally by increasing habitat function and quantity on covered lands for lynx and snowshoe hare and controlling access to the upper Green River Watershed. Because Tacoma is managing for mature forest conditions the amount of late-successional forest will increase from 309 acres to 4,319 acres and the amount of early-successional forest will decrease from 2,363 acres to 1,353 acres. Approximately 6,957 acres of 11,644 forested acres on covered lands will be managed for mature and late-seral conditions. Considering the relatively small amount of land Tacoma owns (14,888 acres) and the small amount of that above 3,000 feet (255 acres) and the relatively large home range of Canada lynx (Ruggiero et al 1994), it is likely that any habitat provided by Tacoma lands would make up only a very small portion of what would be needed to support Canada lynx.

Grizzly Bear

The range limits of grizzly bear predicted by gap analysis modeling did not include the Green River Watershed (Johnson and Cassidy 1997). However, grizzly bears have been documented to the south near Kapowsin, Pierce County, and in four parcels near Snoqualmie Pass in the I-90 North Parcel group land exchange area (COE 1997, USFS 1997). Although this species is considered rare in Washington, it is possible grizzly bears could utilize the upper Green River Watershed on, at least, an occasional basis. To date, no comprehensive surveys have been

conducted by Tacoma or others in the upper Green River Watershed and no incidental observations have been reported.

Mitigation and Minimization Measures

Under the HCP, Tacoma will provide upstream passage of adult salmonids over their Headwork Diversion Dam and around HHD releasing fish above HHD Reservoir to spawn in the upper Green River Watershed. This is anticipated to result in self-sustaining runs of salmon and, in turn, provide an additional food source for grizzly bears and other species closely associated with the salmonid life-cycle.

Tacoma will also not conduct timber felling, yarding, road construction, use of helicopters for commercial timber harvest and silvicutural activities or blast within 1.0 mile of any known grizzly bear den from October 1 through May 31. Additionally, Tacoma will contact FWS and WDFW prior to any timber harvest or road construction within 3.0 miles of a known grizzly bear den to discuss possible steps that can be taken to minimize impacts to potential denning habitat. Tacoma will not construct roads across non-forested blueberry fields, and huckleberry fields, meadows, avalanche chutes, or Type A or B wetlands on covered lands.

In the event of a grizzly bear sighting, Tacoma has committed to suspend all of its forest management and road construction activities within 1.0 mile of the confirmed grizzly bear sighting for 21 days. Tacoma will also retain visual screens along the margin of preferred habitats (meadows, riparian areas, berry fields) or along roads that are within 1.0 mile and in direct line of sight of preferred habitats. The purpose of visual screens is to minimize the effects of human disturbance near key habitats.

Prior to grizzly bear sightings in the watershed, Tacoma will take measures to prevent dumping of putrescent trash that could attract bears, restrict public access to the watershed below Lester, prohibit City employees and other authorized watershed users from dumping or disposing of trash in the Watershed, and cleaning up newly discovered trash disposal sites in the Watershed. Tacoma will also prohibit firearms within the vehicles of contractors working for Tacoma in the Watershed except when being used for security, for WDFW-approved hunts, and by tribal hunters. As general measures, Tacoma will abandon roads on covered lands that are no longer necessary and where Tacoma has control over road use, Tacoma will maintain locked gates to restrict use of roads by the general public. Roads will be abandoned by: 1) removing culverts, fills, water blocks, and unstable landings; 2) stabilizing cut banks and ditches; 3) crowning road surfaces and installing water bars; 4) biomatting steep, erodible slopes; 5) vegetating disturbed soils and biomatted areas with grass and trees; and 6) placement of berms, stumps rootwads, or logs at former entrances.

Primary Beneficial and Detrimental Effects

Habitat Effects

Considerable acreage of mature and late-seral forests is expected to develop in the Natural and Conservation Zones and to a lesser extent in the UMAs and riparian buffers. Over the 50 year life of the HCP, the total amount of mature coniferous forest (106 to 155 years old) on Tacoma

lands is anticipated to increase from 268 acres to 4,027 acres. Together, the 4,319 acres represents 29 percent of the covered lands. In addition, the total amount of late-seral coniferous forests (>155 years old) is expected to increase from 41 acres to 292 acres. By permit expiration, 82 percent of the late-seral forest (238 of 292 acres) and 64 percent of the mature forest (2,593 of 4,027 acres) will be in the Natural Zone. Five percent (15 acres) of late-seral forest and 29 percent (1,161 acres) of mature forest will be in the Conservation Zone. The remaining 15 percent (39 acres) of late-seral and 7 percent (272 acres) of mature forest will be contained in UMAs and riparian buffers. Large blocks of mature forested habitat that develop in the Natural and Conservation zones will provide areas of undisturbed habitat for grizzly bears.

Important habitat, including foraging habitat within 3.0 miles of known grizzly bear dens, will be identified by Tacoma, FWS, and WDFW and management recommendations will be developed and implemented to maintain habitat integrity around dens. Tacoma will not construct roads across non-forested blueberry fields, and huckleberry fields, meadows, avalanche chutes, or Type A or B wetlands on covered lands.

Disturbance Effects

In the Conservation Zone, only stands less than 100 years of age will be subject to an uneven-aged harvest regime for the purposes of accelerating or enhancing the development of late-seral forest characteristics. Disturbance of grizzly bears typically associated with harvest activities can be expected to occur in the Conservation Zone. Roads will need to be constructed in order to harvest some stands in the Conservation Zone and road access necessary to facilitate harvest will increase the amount of disturbance. It is anticipated that by leaving 50 or more dominant or co-dominant trees per acre harvested as required by HCM 3-01C that these areas will develop into a fully stocked stand of large trees with a well developed understory by the time the stands reach 100 years old. Once these stands reach 100 years of age, no additional harvest will be conducted, unnecessary roads will be abandoned, and harvest-related impacts will no longer occur. On average, no more than 2 percent (46 acres) of the coniferous stands in the Conservation Zone will be harvested in any year reducing the frequency and amount of disturbance to a small portion fo the Conservation Zone.

Under the HCP, Tacoma will manage 3,858 acres of their lands for commercial timber harvest. Excluding riparian buffers and UMA, there are approximately 3,285 acres of the 3,858 acres actually available for commercial harvest. Disturbance to grizzly bears associated with timber harvest could potentially occur in the Commercial Zone over the term of the permit. Seasonal timing restriction, restrictions on the size of individual harvest units (maximum of 40 acre harvest units), and limits to the amount of forest habit harvested annually (on average only 1.5 percent (49 acres)) will minimize harvest-related disturbance to grizzly bears.

Human activity associated with silvicultural activities such as planting, pruning, thinning, salvage harvesting, and hardwood conversion may disturb grizzly bears. To avoid human-related disturbances to stands in the Natural Zone and the Conservation Zone where stands are 100 years old or older silvicultural activities will not be conducted. Where silvicultural activities are expected to occur, seasonal timing restrictions and long-term habitat protection measures would

ensure that denning grizzly bears were not disturbed during critical times and habitat near these sites are not significantly altered.

Road construction, management, and use implemented according to the HCP could result in disturbance to grizzly bears. Road densities on Tacoma's ownership are already considered high with respect to the needs of grizzly bears and are expected to stay relatively the same or slightly decrease over the term of the HCP. Road densities on Tacoma's lands average 4.18 miles per square mile (2.7km/sq. km). The highest densities are in the Commercial and Conservation Zones averaging 5.47 and 5.57 miles per square mile, respectively. In the Nature Zone, road densities are considerably less at 2.11 miles per square mile (1.4 km/sq. km), but still could be considered high with respect to the needs of grizzly bears. Tacoma will continue to construct roads in all three zones of their ownership to facilitate watershed operations and forest management activities which could disturb grizzly bears or reduce overall habitat suitability for grizzly bears. To minimize the impact, Tacoma will implement seasonal restrictions around dens and remove unnecessary roads. Tacoma has also committed to maintain locked gates in order to restrict public access to the upper watershed reducing the disturbance of grizzly bears due to frequent vehicle traffic and the potential that bears could be accidentally or intentionally killed.

Injury/Death

Potential for direct injury or death of grizzly bears is possible, but anticipated to be extremely low due to measures to minimize human-bear interactions. For example, permanent abandonment of roads, controlled access to the watershed, and seasonal timing restrictions and long-term habitat protection measures around dens are anticipated to minimize the potential for the direct take of grizzly bears.

Population-Level Effects

The FWS does not anticipate short-term reductions in the baseline of this species to result from the HCP, because the likelihood of incidental take due to habitat modification and disturbance on Tacoma lands under the provisions of the HCP are expected to be rare. Grizzly bears are not currently known to inhabit covered lands or the larger Green River Watershed and Tacoma has agreed to implement den site protection measures should grizzly bears expand their range to include the Green River Watershed.

Marbled Murrelet

As described in the status of the species, marbled murrelets depend on late-successional forest for nesting. The total number of marbled murrelets in the upper Green River Watershed is currently not known. Based on recent survey efforts conducted as part of the I-90 Land Exchange between the USFS and Plum Creek Timber Company, the known occupancy of marbled murrelets in the watershed is limited to two sites on USFS lands. These site are located in Sections 4 of Township 19 North, Range 10 East and Section 32 of Township 20 North, Range 10 East (Cooper et al. 1999). These surveys were conducted as part of the land I-90 land exchange and do not represent a complete survey of all potential habitat in the 147,524 acres upper Green River Watershed. Although Tacoma lands are adjacent to one of these two sites, none of Tacoma's

lands in the watershed are currently known to harbor marbled murrelets and only 319 acres of forest is considered suitable habitat (>105 years old).

Mitigation and Minimization Measures

Minimization and mitigation measures for marbled murrelets include the protection and development of mature and late-seral coniferous forest conditions suitable for marbled murrelet nesting in the Natural and Conservation Zones as well as, but to a lesser extent, in UMAs and riparian buffers. Coniferous forests in the Natural Zone, stands greater than 100 years old in the Conservation Zone, UMAs, and riparian buffers will be allowed to develop without intervention over the life of the permit, while the remaining lands in the Conservation Zone will be managed to accelerate the development of late-seral and mature coniferous forest conditions. Once these stands reach the age of 100 years, no additional timber-harvest activities will be allowed under the HCP.

Tacoma will also implement seasonal restrictions around occupied habitats, habitats where presences has been reported but occupancy has not yet been determined, and in areas of suitable nesting habitat that has not been surveyed for marbled murrelets. These seasonal restrictions will prevent timber felling, yarding, road construction, and the use of helicopters for commercial timber harvest and silvicutural activities within 0.50 mile, and blasting within 1.0 mile of these habitats. The seasonal restrictions are in effect annually from April 1 to August 5 and from 1 hour before sunrise until 2 hours after sunrise and 1 hour before sunset until one hour after sunset between August 6 and September 15 for the 50 year term of the HCP. Tacoma has also committed to using all information available to them, including the results of marbled murrelet surveys conducted by neighboring landowners, to determine where seasonal restrictions would apply. If no information is available, Tacoma will either conduct their own surveys on covered lands, or treat suitable, unsurveyed habitat as occupied.

Primary Beneficial and Detrimental Effects

Habitat Effects

Considerable acreage of mature and late-seral forests capable of supporting marbled murrelet nesting is expected to develop in the Natural and Conservation Zones and to a lesser extent in the UMAs and riparian buffers. Over the 50 year life of the HCP, the total amount of mature coniferous forest (106 to 155 years old) on Tacoma lands is anticipated to increase from 268 acres to 4,027 acres. In addition, the total amount of late-seral coniferous forests (>155 years old) is expected to increase from 41 acres to 292 acres. By permit expiration, 82 percent of the late-seral forest (238 of 292 acres) and 64 percent of the mature forest (2,593 of 4,027) will be in the Natural Zone. Five percent (15 acres) of late-seral forest and 29 percent (1,161 acres) of mature forest will be in the Conservation Zone. The remaining 13 percent (39 acres) of late-seral and 7 percent (272 acres) of mature forest will be contained in UMAs and riparian buffers.

The amount of potential nesting habitat on covered lands, described as 106 years old or older, will increase in total acres not only over the term of the HCP, but from decade to decade. Currently, there is only 309 acres of forest on covered lands that is at least 106 years old. In the subsequent five decades under terms of the HCP, the amount of forested acres that are 106 years

old or older will increase to 353 acres by 2010; 1,432 acres by 2020; 3,063 acres by 2030; 3,755 acres by 2040; and 4,319 acres by 2050.

Forest stands eligible for harvest in the Commercial Zone (3,285 acres) are not known to currently harbor nesting marbled murrelets, but harvest in this zone will remove potential suitable nesting habitat. There are currently 703 acres of coniferous forest 76 to 105 years old and 97 acres of coniferous forest 106 to 155 years old in the Commercial Zone. Over the term of the HCP, stands in the 76 to 105 year old age class will decrease to 50 acres while stands in the 106 to 155 year old age class will increase to 268 acres with an addition 39 acres exceeding 155 years of age. This represents a net decrease of habitat of 346 acres that will not mature into suitable nesting habitat. The remaining 357 acres will mature and become suitable habitat over the term of the HCP. Losses in habitat in the Commercial Zone are expected to be off-set by the overall gain on covered lands of forests 106 years old or older from 309 acres to 4,319 acres.

Disturbance Effects

Some disturbance of marbled murrelets is anticipated as a result of implementing the HCP. Primary activities that could potentially result in disturbance and ultimately lead to take of marbled murrelets include uneven-aged harvest activities in stands in the Conservation Zone, even-aged harvest in the Commercial Zone, road management and use including road abandonment and decommissioning in all zones, and other silvicultural activities in the Conservation and Commercial Zones such as planting, pruning, thinning, salvage harvesting, and hardwood conversion. Although it is expected timing restrictions will minimize the potential for disturbance, covered activities may occur near unknown occupied habitat.

In the Conservation Zone, stands less than 100 years of age will be subject to an uneven-aged harvest regime for the purposes of accelerating or enhancing the development of late-seral forest characteristics. Stands eligible for harvest in the Conservation Zone are not expected to currently provide habitat for marbled murrelets, but disturbance to adjacent habitats may occur during harvest of some of these stands in the Conservation Zone. It is anticipated disturbance would be only short-term and would not likely diminish the suitability of adjacent habitats that may harbor marbled murrelets. To further minimize the amount of disturbance that may result from harvest of stands in the Conservation Zone, seasonal timing restrictions described previously will be implemented when occupancy or presence prior to an occupancy determination in adjacent stands has been observed or where suitable unsurveyed habitat exists. On average, no more than 2 percent (46 acres) of the coniferous stands in the Conservation Zone will be harvested in any year.

Under the HCP, Tacoma will manage 3,858 acres of their lands for commercial timber harvest. Forest stands eligible for harvest in the Commercial Zone (3,285 acres) are not known to currently harbor nesting marbled murrelets, but harvest in this zone may possibly disturb nesting marbled murrelets in adjacent habitats. The potential for disturbance to adjacent habitats is expected to be low because of seasonal timing restrictions in the HCP. Before harvesting in or adjacent to potentially suitable habitat, Tacoma will use all available survey data or, where data is absent, conduct their own surveys to determine the status of stands within 0.25 to 1.0 mile

(distance depends on the covered activity being conducted) of the stand being considered for harvest. If Tacoma does not conduct their own surveys or other marbled murrelet data is unavailable, suitable habitat as determined by the FWS will be treated as occupied until surveys are conducted. To minimize the amount of disturbance that may result from the even-aged harvest of stands in the Commercial Zone, seasonal timing restrictions described previously will be implemented when stands are determined to be occupied, presence has been determined but occupancy has not yet been determined, or if suitable, unsurveyed habitat is present. On average only 1.5 percent (49 acres) of the Commercial Zone will be harvested in any year during the HCP term so areas of disturbance will be spatially and temporally limited.

Salvage harvesting under the HCP will not occur in stands (Natural Zone and stands in the Conservation Zone of 100 years old or older) that are currently capable of supporting nesting marbled murrelets. Activities such as planting, pruning, thinning, and hardwood conversion occur in stands incapable of supporting marbled murrelet nesting. If such activities occur near occupied habitats, habitats where presences has been reported but occupancy has not yet been determined, or in areas of suitable nesting habitat that has not yet been surveyed for marbled murrelets, seasonal restrictions would be implemented to minimize the disturbance effects of these activities.

Road construction, management, and use implemented according to the HCP could, in some instances, result in disturbance to marbled murrelets. In addition to seasonal timing measures , Tacoma will remove unnecessary roads in accordance with HCM 3-03I of the HCP and will cause no net increase of roads in the Natural Zone where habitat for marbled murrelets currently exists. In addition, Tacoma has also committed to maintain locked gates to restrict public access to the upper watershed, thereby reducing the disturbance of marbled murrelets due to frequent vehicle traffic.

Injury/Death

Potential for direct injury or death of marbled murrelets is anticipated to be extremely low. Under the HCP, Tacoma has committed to protecting and increasing the amount of suitable habitat for marbled murrelets on its ownership. Areas where Tacoma plans to conduct timber harvest-related activities are not likely to support marbled murrelet nesting. Lands adjacent to covered lands that contain marbled murrelets will be protected by seasonal timing restrictions minimizing the potential for injury.

Population-Level Effects

The FWS does not anticipate short-term reductions in the baseline of this species to result from the HCP, because the likelihood of incidental take due to habitat modification and disturbance on Tacoma lands and adjacent habitats under the provisions of the HCP are expected to be very small. To accomplish this, Tacoma under terms of the HCP, is expected to protect all existing suitable habitat on its ownership, grow and protect additional habitat over the life of the HCP, and implement conservative seasonal timing restrictions around occupied habitat, habitat where presence has been detected but occupancy not yet determined, and all suitable but unsurveyed habitat on their covered lands and neighboring lands.

Throughout its 50 year term, the HCP is expected to benefit marbled murrelets and contribute to improvements in its status both locally and regionally. Increases in habitat function and quantity can accommodate an increase in population size and improve productivity on covered lands and in the larger watershed. Late-seral and mature coniferous forest habitats will increase on Tacoma lands from its current 309 acres to 4,319 acres over the life of the HCP. Increase in these forest habitat types could potentially lead to increases in the population of marbled murrelets at the local level and have positive effects on the regional population.

Northern Spotted Owl

There are currently 16 known northern spotted owl activity centers within 1.8 miles of the covered lands. These 16 centers represent 15 pairs of owls (10 with confirmed reproduction) and one single owl of unknown status. Nine of these sites are within 0.7 mile of the covered lands and, of those, one site center is located on the covered lands (single owl of unknown status) (WDNR 2000).

Mitigation and Minimization Measures
Minimization and mitigation measures for northern spotted owls include the protection and establishment of mature and late-seral coniferous forest conditions suitable for nesting in the Natural and Conservation Zones as well as in UMAs and riparian buffers. Coniferous forests in the Natural Zone, stands equal or greater than 100 years old in the Conservation Zone, UMAs, and no-harvest riparian buffers will be allowed to develop without intervention over the life of the permit. The remaining lands in the Conservation Zone will be managed to accelerate the development of mature and late-seral coniferous forest conditions. Once these stands reach 100 years old, no final harvest will occur.

Tacoma will also implement seasonal timing restrictions and protect habitat around nest sites for covered activities to protect nesting northern spotted owls. Under seasonal restrictions, Tacoma will conduct no timber felling, yarding, road construction, and aircraft activity within 0.25 mile, or blasting within 1.0 mile of the activity center of any northern spotted owl pair. These restrictions will be implemented annually from March 1 to June 30. Under nest protection measures, Tacoma will conduct no timber felling or other habitat alterations within 660 feet of the activity center of any known northern spotted owl pair or resident single in the watershed. This protection measure restrictions will apply where Tacoma intends to harvest timber and will remain in place until a site center has been found to be unoccupied for at least 36 months using protocol surveys.

During the harvest of timber in the Commercial Zone and those portions of the Conservation Zone less than 100 years old, Tacoma has committed to retain all safe snags, a minimum of four green recruitment trees, and four logs per acre harvested. If at least six suitable snags as defined in HCM 3-01G in the HCP are not available per acre harvested, additional green recruitment trees will be retained at a ratio of 1 to 1. If less that two snags are available per acre, Tacoma will actively create 2 snags per acre from 2 of the larger green recruitment trees. This measure will be adaptively managed to ensure snags adequate for northern spotted owls will be part of the

landscape on covered lands subject to harvest. All snags will be retained in the Natural Zone, stands in the Conservation Zone 100 years old or older, UMA, and no-harvest riparian buffers, except danger trees within 150 feet of active roads.

Primary Beneficial and Detrimental Effects

Habitat Effects

Suitable northern spotted owl habitat on covered lands has been classified in the HCP as Type A capable of supporting nesting, roosting, and foraging; Type B - capable of supporting roosting and foraging; and Type C - capable of supporting foraging only (Table 2). Currently, the covered lands contain 1,718 acres of Type A, B, and C northern spotted owl habitat that lie within 1.8 miles of one or more known activity centers. Of this, approximately 567 acres lie within 0.7 miles of an activity center.

Table 2 **Suitable spotted owl habitat in the Green River HCP Area within 1.8 miles of known spotted owl activity centers.**

Forest Management Zone Acres of Suitable Spotted Owl Habitat

	Type A	Type B	Type C	TOTAL
Natural Zone	48.9	561.2	182.8	792.9
Conservation Zone	0.0	194.3	298.8	493.1
Commercial Zone	61.2	165.9	205.2	432.3[1]
Total	110.1	921.4	686.8	1718.3

[1]Includes 39.0 acres to be retained in UMA (UMA).

Nesting, Roosting, Foraging, and Dispersal (N/R/F/D)

Considerable acreage of mature and late-seral forests capable of supporting N/R/F/D by northern spotted owls as defined by WAC 222-16-085(1) is expected to develop over time in the Natural and Conservation Zones and to a lesser extent in the UMAs and riparian buffers. Over the 50 year life of the HCP, the total amount of mature coniferous forest (106 to 155 years old) on Tacoma lands is anticipated to increase from 268 acres to 4,027 acres. In addition, the total amount of late-seral coniferous forests (>155 years old) is expected to increase from 41 acres to 292 acres. Together, the 4,319 acres represents 29 percent of covered lands. By permit expiration, 82 percent of the late-seral forest (238 of 292 acres) and 64 percent of the mature forest (2,593 of 4,027) will be in the Natural Zone. Five percent (15 acres) of late-seral forest and 29 percent (1,161 acres) of mature forest will be in the Conservation Zone. The remaining 13 percent (39 acres) of late-seral and 7 percent (272 acres) of mature forest will be contained in UMAs and riparian buffers. By 2048 it is projected that all riparian areas will be 55 years of age or older, with 53 percent (1,134 acres) between 106 and 155 years old and 4 percent (77 acres) exceeding 155 years old. Riparian buffers will occupy 2,125 acres of the covered lands. Overall, conservation gains for northern spotted owls in the terms of mature and late-seral forest is expected to come mainly from Natural and Conservation Zones. Roughly 78 percent of the covered lands is forested, two-thirds (7,776 acres) of which are within the Natural and

Conservation Zones. Over the permit term, mature and late-seral forest are not subject to harvest in the Natural Zone, Conservation Zone, UMAs, and riparian buffers.

Roosting, Foraging, and Dispersal (R/F/D)
Habitat suitable for R/F/D (>75 years old) will increase significantly in two of the three designated zones and in riparian forests over the term of the permit. Coniferous forest habitat in the Natural Zone will be allowed to develop without intervention. As a result, habitat suitable for RFD in the Natural Zone will increase from its current 2,100 acres to 2,441 acres. Coniferous forest habitat in the Conservation Zone will exhibits similar gains in RFD habitat, although periodic uneven-aged harvest will occur. Although these harvest activities are expected to have some short-term impacts, the purpose of the uneven-aged harvest is to accelerate the development of mature and late-seral forest which will also result in habitat suitable for RFD. In the Conservation Zone, stands greater than 75 years old are expected to increase from 1,080 to 1,762 acres over the term of the permit.

The effects of habitat loss on northern spotted owl activity centers will be relatively small and almost entirely limited to the Commercial Zone (see Table 3). Suitable habitat on covered lands in seven of the 16 identified activity centers in the upper Green River Watershed are located in the Natural Zone, and therefore, will not be subject to harvest or harvest-related activities. Suitable habitat on covered lands in eight activity centers is located in the Conservation Zone. Habitat on covered lands that lie within these activity centers will be affected in the short-term under the uneven-aged harvest regime, but is expected to result in an increase of suitable northern spotted owl habitat over the life of the permit. Suitable habitat on covered lands in one activity center is located solely in the Commercial Zone. Habitat in the Commercial Zone is subject to harvest under terms of the HCP.

No-harvest and partial-harvest riparian buffers as well as UMAs are anticipated to contribute to northern spotted owl RFD habitat over the life of the permit. Overall, riparian forest stands that are 76 years old or older will increase from the current 491 acres to 999 acres of mature conifer over the term of the permit.

Habitat losses due to even-aged harvest on covered lands in the Commercial Zone will occur within 1.8 miles of five activity centers, four of which also intersect the Conservation Zone. The other activity center intersects only the Commercial Zone. The amount of suitable habitat removed as a result of timber harvest in the Commercial Zone will reduce the available habitat in each of these activity centers, but suitable habitat in each activity center will be reduced by no more than 2 percent. Under the HCP, no activity center with habitat that lies within the Commercial Zone will be reduced to less than 40 percent suitable habitat within 1.8 miles of the activity center, except one site identified as single, unknown status. Habitat in this activity center is currently less that 40 percent (31%).

The Commercial Zone contains 432 acres of suitable northern spotted owl habitat (Type A, B, and C) within 1.8 miles of one or more activity centers. Most of this habitat will be available for harvest under the HCP. Approximately 39 acres of the 432 will be retained in UMAs, and

therefore, will not be harvested over the term of the HCP. An additional, undetermined amount of acres will also be preserved in no-harvest riparian buffers. At a maximum, this leaves 393 acres of suitable northern spotted owl habitat that would be available for harvest under the HCP within 1.8 miles of one or more activity centers. Of this 393 acres, 61 acres have been identified as Type A, 166 acres are identified as Type B, and 205 acres has been identified as Type C. It is not anticipated that habitat currently identified as Type B and Type C habitat will develop into Type A habitat before it is subject to harvest. Over the life of the plan, a portion of the 514 acres of riparian buffer in the Commercial Zone will develop late-seral and mature forest characteristics and function as owl habitat to off-set some of the expected loss in habitat in the Commercial Zone.

Table 3 Total percent suitable spotted owl habitat available within 0.7 mile and 1.8 miles of known spotted owl activity centers, and percent habitat proposed for harvest under the Green River HCP.

Activity Center I.D. Number	Percent Suitable Spotted Owl Habitat Within 0.7 Mile of Activity Center			Percent Suitable Spotted Owl Habitat Within 1.8 Miles of Activity Center		
	Total Available	Proposed for Even-aged Harvest	Proposed for Uneven-aged Harvest	Total Available [1]	Proposed for Even-aged Harvest	Proposed for Uneven-aged Harvest
212	41	0	0	26	0	0
548	73	0	0	47	0	< 1
555	64	0	< 1	54	< 1	< 1
589	55	0	0	48	0	0
727	48	1	< 1	45	2	< 1
737	47	0	< 1	37	0	0
760	66	< 1	0	48	< 1	2
762	64	< 1	0	53	2	0
769	63	0	0	53	0	0
791	52	0	0	35	0	0
793 [2]	17	2	1	31	2	2
857	38	0	0	35	0	0
859	56	0	0	55	0	3
888	50	0	0	40	0	0
955	60	0	0	51	0	0
1153	83	0	0	43	0	< 1

[1] Based on Washington Department of Natural Resources data of 1 October 1999.
[2] Site does not have resident status.

To mitigate for the impacts of timber harvest, Tacoma has agreed to retain all safe snags, a minimum of four green recruitment trees, and four logs per acre harvested. If at least six suitable snags as defined in HCM 3-01G in the HCP are not available per acre harvested, additional green recruitment trees will be retained at a ratio of 1 to 1. If less than two snags are available per acre, Tacoma will actively create 2 snags per acre from 2 of the larger green recruitment trees expected to be at least 16 to 20 inches in diameter. This measure will be adaptively managed to ensure snags will be part of the landscape on covered lands subject to harvest. Snag, green recruitment tree, and log measures are double of that required under the current Washington State Forest Practices.

Disturbance Effects

Some disturbance of northern spotted owls is anticipated as a result of implementing the HCP. Primary activities that could result in disturbance and ultimately lead to take of northern spotted owls include uneven-aged harvest activities in stands in the Conservation Zone less than 100 years old, even-aged harvest in the Commercial Zone (3,858 acres), road management and use including road abandonment and decommissioning, and other silvicultural activities such as planting, pruning, thinning, salvage harvesting, and hardwood conversion.

In the Natural Zone and in portions of the Conservation Zone that are 100 years old or older will be protected from harvested-related activities under the HCP. The remaining lands in the Conservation Zone will be managed under an uneven-aged harvest regime to promote the development of mature and late-seral forest conditions. Periodic commercial thinning prior to stands reaching 100 years old will occur on approximately 2,000 acres, and has the potential to temporarily disturb or displace some resident northern spotted owls. Once these stands reach 100 years of age, no additional timber harvest will be conducted and, consequently, there should be no additional harvest-related impacts to northern spotted owls. When covered activities do occur in the Conservation Zone, timing restrictions agreed in HCM 3-040 in the HCP and the nest protection measure agreed to in HCM 3-04P in the HCP will be implemented. Timing restrictions prevent harvesting during the nesting season. The nest protection measure will maintain habitat immediately surrounding the nest (31 acres), but allow for uneven-aged harvest or thinning to occur outside the nesting period to accelerate the development of mature and late-seral forest conditions in the Conservation Zone.

Under the HCP, Tacoma will manage 3,858 acres (3,285 available for harvest) of their lands for commercial timber harvest. The objective in this zone is to grow and harvest timber commercially on a sustainable basis. These stands will be managed on a 70 year, even-aged rotation. The rate of harvest in Commercial Zone will average approximately 49 acres per year over the term of the HCP. As a result of this harvest regime, disturbance to northern spotted owls will occasionally occur. Currently no known northern spotted owl nest are located on commercial lands, and none are expected to occur over the term of the HCP. If northern spotted owls establish a nest in the Commercial Zone, Tacoma will implement seasonal timing restrictions and retain a forested buffer (31 acres) around the nest site. The intent of the buffer is not to maintain a nest in the Commercial Zone in the long-term, but reduce direct impacts to nesting northern spotted owls and allow for the transition of displaced northern spotted owls to

unoccupied habitat in the Natural and Conservation Zones. These two zones are specifically managed to protect existing suitable northern spotted owl habitat (309 acres) and develop addition northern spotted owl habitat (4,027 acres) over the term of the permit. When covered activities do occur in the Commercial Zone, timing restrictions agreed in HCM 3-040 in the HCP and the nest protection measure agreed to in HCM 3-04P in the HCP will be implemented.

Other silvicultural activities such as planting, pruning, thinning, salvage harvesting and hardwood conversion are not anticipated to have a significant disturbing effect on northern spotted owls due to HCP measures designed to avoid adverse effects. Salvage harvesting under the HCP will not occur in stands (Natural Zone and stands in the Conservation Zone of 100 years old or older) that are currently capable of providing N/R/F/D habitat for northern spotted owls. Activities such as planting, pruning, thinning, and hardwood conversion generally occur in stands incapable of supporting northern spotted owl nesting. When silvicultural activities such as planting, pruning, thinning, salvage harvesting and hardwood conversion are conducted near known nesting sites, timing restrictions agreed in HCM 3-040 in the HCP and the nest protection measure agreed to in HCM 3-04P in the HCP will be implemented.

Road construction, management, and use implemented according to the HCP could, in some instances, result in disturbance to northern spotted owls. To minimize impacts to northern spotted owls from road construction, maintenance, and use as described in the HCP, Tacoma has committed to remove unnecessary roads and will cause no net increase of roads in the Natural Zone. In addition, Tacoma has also committed to maintain locked gates to restrict public access to the upper watershed, thereby reducing the disturbance of owls due to frequent vehicle traffic. When road construction, management, and use occur near known nesting sites, timing restrictions agreed in HCM 3-040 in the HCP and the nest protection measure agreed to in HCM 3-04P in the HCP will be implemented.

Injury/Death

Potential for direct injury or death of northern spotted owls is anticipated to be extremely low. Under the HCP, Tacoma has committed to protecting the majority of the existing northern spotted owl habitat and increasing the amount of suitable habitat on its ownership over the term of the permit. To minimize the likelihood of direct injury or death of northern spotted owls, Tacoma will implement seasonal timing restrictions around nesting pairs as agreed in HCM 3-040 in the HCP and the nest protection measure agreed to in HCM 3-04P in the HCP around nest sites.

Population-Level Effects

The FWS anticipates a short-term reduction in the baseline of this species to result from the implementation of the HCP. Incidental take of this species due to habitat modification may occur in the Commercial Zone, but such take is expected to be off-set by the habitat protection and enhancement measures in both the Natural and Conservation Zones. As a result of these measures, mature and late-seral coniferous forest (forest 106 years old or older) on Tacoma's ownership is expected to increase from its current 309 acres to 4,319 acres over the term of the HCP. Increases in the forest habitat types could lead to significant increases in the population of

northern spotted owls in the upper Green River Watershed and have a positive influence on the regional population.

Proposed Species:

Dolly Varden (see bull trout analysis)

Candidate Species

Oregon Spotted Frog

Historically, the Oregon spotted frog occurred from southwest British Columbia south to the northeast corner of California. In Washington, it was found in the Puget Trough from the Canadian border to the Columbia River and east into the southern Washington Cascades (McAllister and Leonard 1997). Based on museum records dated 1905, Oregon spotted frogs have been found at two locations in King County. Neither of these locations are within close proximity to the upper Green River Watershed. At present, only three populations of Oregon spotted frog are known to exist in Washington (McAllister and Leonard 1997). The closest site is located in Thurston County, and the other two sites are in Klickitat County.

The Oregon spotted frog inhabits emergent wetlands within forested landscapes and historically has been associated with lakes in the Puget Trough (McAllister and Leonard 1997). Data on Oregon spotted frog suggests a relationship with large marshes which are more likely to achieve suitable warm summer temperatures and support frog populations large enough to ameliorate the effects of high predation rates (Hayes 1994). Though not typically found under a forest canopy, Oregon spotted frogs have been found in association with riparian forests and areas of dense shrub cover (McAllister and Leonard 1997).

Mitigation and Minimization Measures

Tacoma will retain no-harvest riparian buffers along all streams and wetlands within covered lands. No-harvest buffer widths will vary according to stream and wetland types. No-harvest riparian buffers on WDNR Stream Types 1 and 2 will be 200 feet wide. No-harvest buffers on Type 3 streams will be 150 feet wide. No-harvest buffers on Type 4 stream will be 50 feet wide and expand out to 100 feet at key locations. These locations are at the origin of Type 4 streams, at headwalls and along steep and unstable slopes, at confluences with other Type 4 streams, at the confluences of Type 4 streams with fish-bearing streams, around springs and seeps, and along low gradient reaches. No-harvest riparian buffers on Type 5 streams will be 25 feet wide. In addition, the HCP requires partial-harvest riparian buffers of 50 feet on Type 3 streams and 25 feet on Type 5 streams. These buffers are in addition to and upland of the no-harvest buffers required for these stream types. When conducting partial harvest on Type 3 stream buffers, Tacoma has agreed under the HCP to leave the largest 70 coniferous trees per acre. On Type 5 streams, Tacoma has committed to retaining the largest 50 coniferous trees per acre. All buffer widths will be measured horizontally on both sides of the stream from the ordinary high water mark, channel migration zone, or channel disturbance zone whichever is greater.

Wetland buffers will also vary in width according to the size and type of wetland encountered (See table 5.3 of the HCP). Non-forested wetlands with at least 0.5 acre of open water will receive 100 to 200-foot no-harvest buffers. Non-forested wetlands with less than 0.5 acres of open water with receive 50 to100-foot no-harvest buffers. Forest wetlands described at greater than 30 percent canopy coverage will receive no-harvest buffers varying in width from 25 to 50 feet. All buffers will be measures horizontally from the edge of the wetland.

To reduce impacts of sediment from road construction and maintenance Tacoma will: 1) participate in Watershed Analysis, 2) participate in the development and implementation of a Road Sediment Reduction Plan, 3) implement mass wasting prescriptions from Watershed Analysis for all new road construction, 4) use full bench construction with no side-casting of material on all side slopes greater than 60 percent, 5) mulch and seed all road cuts, 6) maintain locked gates to restrict road access, 7) abandon all roads that are no longer needed for watershed management, forestry, or HCP implementation, and 8) discontinue heavy truck traffic when there is a potential for excessive road damage or water quality impacts. In addition, Tacoma will not construct roads across Type A or B wetlands. These measures combined with riparian buffers are anticipated to substantially reduce sediment delivery to non-fish and fish-bearing streams, non-forested and forested wetlands, and the reservoir.

Primary Beneficial and Detrimental Effects

Habitat Effects

The factors which contributed to loss of populations throughout the range of the Oregon spotted frog remain largely unknown (McAllister and Leonard 1997). Habitat loss, pesticide use, UV-B radiation, the *Saprolegnia* fungus, and the introduction of exotic aquatic predators like the bullfrog have been identified as the major threats to the existing populations (McAllister and Leonard 1997). Covered activities that influence the amount and quality of potential Oregon spotted frog habitat include activities related to the commercial management and harvest of timber; road construction, maintenance and use; withdrawal of water at Tacoma's Headworks; and Tacoma's ability to control access to the upper watershed.

The amount of potential Oregon spotted frog habitat on covered lands is not known and although no surveys for Oregon spotted frogs have been conducted, based on recent literature (McAllister and Leonard 1997, Leonard et al. 1993) the species is not suspected to inhabit covered lands. If potential habitat exists on covered lands, normal operations related to commercial timber management and harvest could adversely impact the amount and quality of such habitat. To minimize these impacts, all wetlands will be buffered, except non-forested wetlands smaller than 0.25 acre and forested wetlands smaller than 0.50 acre in the Commercial Zone and parts of the Conservation Zone eligible for harvest. The amount of small non-forested and forested wetlands on covered lands subject to harvest is undeterminable at this time, but it is not anticipated to be significant. To minimize this impact, smaller wetlands as specified above that are located in the Natural Zone, stands in the Conservation Zone 100 years old or older, UMAs, or within no-harvest riparian buffers adjacent to streams, will be protected because these areas are not eligible for harvest under terms of the HCP. Based on Oregon spotted frogs preference for larger

wetlands (McAllister and Leonard 1997, Leonard et al. 1993), almost all potential habitat will be preserved or protected by no-harvest riparian buffers.

Sedimentation that results from timber-harvest activities and road construction, maintenance, and use could also adversely affect potential Oregon spotted frog habitat by filling the shallow, warmer portions of non-forested wetlands Oregon spotted frogs prefer for breeding and egg laying (McAllister and Leonard 1997). Adequate buffering of suitable habitat can ameliorate these effects by filtering out sediment before entering wetlands or other water bodies. Under the HCP, non-forested wetlands with an open water portion greater than or equal to 0.50 acre and total size greater than five acres will receive 200-foot no-harvest riparian buffers, and wetlands with an open water portion greater or equal to 0.50 acre and a total size less than 5.0 acres will receive 100-foot no-harvest riparian buffers. Non-forested wetlands with an open water portion less than 0.50 acre and a total size greater than 5.0 acres will receive 100-foot no-harvest riparian buffers, and wetlands with an open water portion less than 0.50 acre and a total size less than or equal to 5.0 acres will receive 50-foot no-harvest riparian buffers.

Under the HCP, Tacoma will also implement measures to reduce the amount of sediment being delivered to wetlands and riparian habitats. Tacoma will contribute funds and participate in the development of a Road Sediment Reduction Plan describing the priorities and schedule for road maintenance, improvement, and abandonment activities that will be implemented to reduce road sediment inputs to less than 50 percent of the estimated background sediment production rates as determined by Watershed Analysis. Within two years of the permit issuance, Tacoma will prepare and prioritize plans to abandon unnecessary roads and within five years Tacoma will complete the abandonment of the roads identified. Tacoma will implement prescriptions developed by Watershed Analysis specific to the construction of new temporary and permanent roads. When constructing roads on side slopes greater than 60 percent, Tacoma will use full bench construction with no side-casting of excavated material. Tacoma will not build roads across Type A and B wetlands. Tacoma will place mulch and grass seed on all road cuts with slopes greater that 40 percent near water crossings, as well as in all locations where there is the possibility of severe erosion or slumping above the road. Where Tacoma has control over road use, they will maintain locked gates to restrict road use by the general public and will also discontinue heavy truck traffic under its control when there is a potential for extraordinary damage to the road or excessive impacts to water quality. These measures combined with riparian buffers are anticipated to substantially reduce sediment delivery to non-fish and fish-bearing streams, wetlands, and the reservoir.

Water withdrawal from the Green River under provisions HCM 1-01 and 1-02 of the HCP could alter water levels in wetlands adjacent to the middle and lower Green River. Water withdrawals are more likely to affect water levels in adjacent wetlands during the summer low flow period. In-stream flow measures designed to provide stable summer flows for salmonids will minimize the effect water withdrawals would have on adjacent wetlands. If Oregon spotted frogs were present in adjacent wetlands, breeding activities would be expected to occur earlier in the year and not be affected by summer low flows. At the three locations in Washington where Oregon spotted frogs are known to occur and breed, breeding activity occurs during a four week period in

February or March depending on elevation and latitude. Flows in the lower and middle Green River and the level of water in adjacent wetlands is expected to be adequate during these months.

Disturbance Effect

The introduction of aquatic predatory species (e.g. bull frogs) is another factor that likely contributed to the decline of Oregon spotted frog range wide and is considered a potential serious threat to the existing populations in Washington (McAllister and Leonard 1997, Leonard et al. 1993). To minimize the likelihood that aquatic predators become established or, if present, expand their range in the upper Green River Watershed, Tacoma has committed to maintaining locked gates to restrict road use by the general public.

Other covered activities that could result in the disturbance to or injury of Oregon spotted frog include: timber-harvest and hauling activities; road construction, maintenance, decommissioning and use; road culvert removal, replacement, and maintenance; and silvicultural activities such as planting and thinning. The amount of disturbance to Oregon spotted frog is expected to be minimal because frogs are currently not known to occur in the watershed, covered activities are expected to occur a low levels based on the amount of timber harvest Tacoma engages in on a yearly basis, and riparian and wetland protection measures are designed to minimize disturbance to habitat.

Injury/Death

Potential for direct injury or death of Oregon spotted frog is anticipated to be extremely low. Controlling public access to the watershed, reducing sediment delivery to potential habitat, and buffering of potential habitat are anticipated to minimize the potential for the direct take of Oregon spotted frog should they be found to inhabit the plan area. Some Oregon spotted frog could be accidently killed on roads traveled by Tacoma employees and contractors during normal watershed operations.

Population-Level Effects

The FWS does not anticipate short-term reductions in the baseline of this species to result from the HCP, because the likelihood of incidental take due to habitat modification and disturbance on Tacoma lands under the provisions of the HCP are expected to be very small. Oregon spotted frogs are not currently known to inhabit wetlands on covered lands or the larger Green River Watershed, and based on the current known population distribution it is unlikely that Oregon spotted frogs will colonize wetlands in the upper Green River Watershed in the near term.

The HCP is expected to have a net positive effect on potential Oregon spotted frog habitat by protecting existing suitable habitat and limiting the potential for the introduction of aquatic predators by controlling access to the upper Green River Watershed. Protections afforded potential Oregon spotted frog habitat under this HCP exceeds wetland protections required under current state forest practice rules.

Unlisted Species

California Wolverine

Scheffer (1938) concluded that the few reported California wolverines in Washington were individuals wandering in from Canada. Some records in atypical habitats indicate the presence of dispersing California wolverines (Ruggiero et al 1994), such as a male that was trapped in the center of the Okanogan Valley (Scheffer 1941). California wolverines were likely present in the Cascades prior to 1919, but absent or rare from 1920 to 1959 (Johnson 1977). Any recent sightings of California wolverines in Washington can be attributed to California wolverines dispersing from Canada and expanding their range into Washington. There are 28 records of California wolverines from 1970 to 1990 and their present distribution is not known (Ruggiero et al 1994).

Little seems to be known about the habitat preferences of California wolverines (Ruggiero et al 1994). In general terms, California wolverine habitat has been described as habitat that provides year-round food supplies in large, sparsely inhabited wilderness areas (Kelsall 1981). At the stand level, preferred habitats includes mature, late-successional, and old-growth coniferous forests as well as forested wetlands and forested riparian areas. Natal dens in forested areas have been associated with root complexes, hollow logs, cavities in large trees, beaver dens, abandon bear dens, rocks, and talus slopes (Ruggiero et al 1994). Human disturbance, habitat fragmentation, and land-use activities that result in increased access to remote areas are the likely determinants of habitat suitability and use by California wolverines (Ruggiero et al 1994).

Minimization and Mitigation Measures

Minimization and mitigation measures for California wolverines include the protection and establishment of mature and late-seral coniferous forest conditions in the Natural and Conservation Zones as well as in UMAs and to a lesser extent riparian buffers. Coniferous forests in the Natural Zone, stands greater than 100 years old in the Conservation Zone, UMAs, and riparian buffers will be allowed to develop without intervention over the life of the permit, while the remaining lands in the Conservation Zone will be managed to accelerate the development of late-seral and mature coniferous forest conditions. Once these stands reach the age of 100 years, no additional timber-harvest activities will be allowed under the HCP.

During the harvest of timber in the Commercial Zone and those portions of the Conservation Zone less than 100 years old, Tacoma has committed to retain all safe snags, a minimum of four green recruitment trees, and four logs per acre harvested. If at least six suitable snags as defined in HCM 3-01G in the HCP are not available per acre harvested, additional green recruitment trees will be retained at a ratio of 1 to 1. If less that two snags are available per acre, Tacoma will actively create 2 snags per acre from 2 of the larger green recruitment trees. This measure will be adaptively managed to ensure snags will be part of the landscape on covered lands subject to harvest. All snags and downed logs will be retained in the Natural Zone, stands in the Conservation Zone 100 years old or older, UMA, and no-harvest riparian buffers, except danger trees within 150 feet of active roads.

Tacoma will also implement seasonal restrictions around California wolverine dens. Tacoma will not conduct timber felling, yarding, road construction, use of helicopters for commercial timber harvest and silvicutural activities or blast within 0.50 mile of any known wolverine den from October 1 to May 31. In addition, public access to the watershed will be controlled.

Primary Beneficial and Detrimental Effects

Habitat Effects

Considerable acreage of mature and late-seral forests is expected to develop in the Natural and Conservation Zones and to a lesser extent in the UMAs and riparian buffers. Over the 50 year life of the HCP, the total amount of mature coniferous forest (106 to 155 years old) on Tacoma lands is anticipated to increase from 268 acres to 4,027 acres. In addition, the total amount of late-seral coniferous forests (>155 years old) is expected to increase from 41 acres to 292 acres. By permit expiration, 82 percent of the late-seral forest (238 of 292 acres) and 64 percent of the mature forest (2,593 of 4,027) will be in the Natural Zone. Eight percent (19 acres) of late-seral forest and 29 percent (1,161 acres) of mature forest will be in the Conservation Zone. The remaining 13 percent (39 acres) of late-seral and 7 percent (272 acres) of mature forest will be contained in UMAs and riparian buffers. The increase of mature and late-seral forest on covered lands is expected to provide more functional wolverine habitat over the term of the HCP.

Both the UMAs and riparian buffers will not be subject to timber harvest during the life of the HCP, except the partial-harvest portion of both Type 3 and Type 5 streams. In addition, the HCP requires partial-harvest riparian buffers of 50 feet on Type 3 streams and 25 feet on Type 5 streams. These buffers are in addition to the no-harvest buffers required for these stream types. When conducting partial harvest on Type 3 stream buffers, Tacoma has agreed under the HCP to leave the largest 70 coniferous trees per acre. On Type 5 streams, Tacoma has committed to retaining the largest 50 coniferous trees per acre. All buffers widths will be measured horizontally on both sides of the stream from the ordinary high water mark, channel migration zone, or channel disturbance zone whichever is greater. By 2048 it is projected that all riparian areas will be 55 years of age or older, with 4 percent of these areas exceeding 155 years old. Riparian buffers cover 2,125 acres of the covered lands. Although UMAs constitute a small portion of Tacoma's ownership, theses areas are not subject to harvest and consequently could provide some additional habitat for wolverines. Riparian corridors could also act as travel corridors facilitating the movement of California wolverines in the watershed. There are currently 103 acres of UMAs in the Conservation Zone and 150 acres in the Commercial Zone.

Disturbance Effects

Primary activities that could result in disturbance and potentially lead to the incidental take of California wolverines include uneven-aged harvest activities in stands in the Conservation Zone, even-aged harvest in the Commercial Zone, and road management and use, including road abandonment and decommissioning.

In the Conservation Zone, stands less than 100 years of age will be subject to an uneven-aged harvest regime for the purposes of accelerating or enhancing the development of late-seral forest characteristics. It is anticipated that these disturbances will be short-term in nature and would

not likely diminish the suitability of the stand's habitat for California wolverines. Over the 50 year term of the HCP, areas in the Conservation Zone that are subject to uneven-aged harvest and those areas of the Conservation Zone 100 years old or older, are expected to develop late-seral forest conditions. No more than 2 percent (46 acres) of the coniferous stands in the Conservation Zone will be harvested in any year, minimizing the number of entries and disturbance to one or two per year.

Under the HCP, Tacoma will manage 3,858 acres of their lands for commercial timber harvest. Excluding riparian buffers and UMAs, there are approximately 3,285 acres of the 3,858 acres available for commercial harvest. The objective in this zone is to grow and harvest timber commercially on a sustainable basis including pre-commercial and commercial thinnings. These stands will be managed on a 70 year, even-aged rotation. On average, only 1.5 percent (49 acres) of the Commercial Zone will be harvested in any year during the HCP term minimizing the number of entries to one or two per year.

Road construction, management, and use implemented according to the HCP could result in disturbance to California wolverines. Road densities on Tacoma's ownership are already considered high with respect to wolves and similar assumptions can be made of current road densities and their effects on California wolverines. Road densities on cover lands will stay the same or slightly decrease over the term of the HCP. Road densities on Tacoma's lands average 4.18 miles per square mile (2.7km/sq. km). The highest densities are in the Commercial and Conservation Zones averaging 5.47 and 5.57 miles per square mile, respectively. In the Natural Zone, road densities are considerably less at 2.11 miles per square mile (1.4 km/sq. km). Open road densities served as an surrogate for human disturbance and California wolverines are known to avoid areas disturbed by humans (Ruggiero et al. 1994). Tacoma will continue to construct roads in all three zones to facilitate watershed operations and forest management activities which could disturb California wolverines or lower habitat suitability.

To minimize the impact of timber-harvest in the Conservation and Commercial Zones and road-related activities, Tacoma will implement seasonal restrictions around known dens. Tacoma will also remove unnecessary roads. Tacoma has also committed to maintain locked gates in order to restrict public access to the upper watershed reducing the disturbance of California wolverines due to frequent vehicle traffic and the potential that California wolverines will be accidentally or intentionally killed or trapped.

Injury/Death

The potential for direct injury or death of a California wolverine is anticipated to be extremely low. Because the watershed is closed to the general public and seasonal restrictions will be implemented around active dens, the potential for direct mortality of California wolverines is considered to be rare.

Population-Level Effects

The FWS does not anticipate short-term reductions in the baseline of California wolverines to result from the HCP, because the likelihood of incidental take due to habitat modification and

disturbance on Tacoma lands under the provisions of the HCP are expected to be rare. California wolverines are not currently known to inhabit covered lands or the larger Green River Watershed.

Cascades Frog

Cascades frogs are most common in small ponds adjacent to streams flowing through subalpine meadows. They also inhabit sphagnum bogs and fens, seasonally flooded areas, forested swamps, small lakes, ponds, and marshy areas adjacent to streams. Cascades frogs rarely occur below 2,000 feet in elevation (Leonard et al 1993).

Mitigation and Minimization Measures

Tacoma will retain no-harvest riparian buffers along all streams and wetlands within covered lands. No-harvest buffer widths will vary according to stream and wetland types. No-harvest riparian buffers on WDNR Stream Types 1 and 2 will be 200 feet wide. No-harvest buffers on Type 3 streams will be 150 feet wide. No-harvest buffers on Type 4 streams will be 50 feet wide and expand out to100 feet at key locations. These locations are at the origin of Type 4 streams, at headwalls and along steep and unstable slopes, at confluences with other Type 4 streams, at the confluences of Type 4 streams with fish-bearing streams, around springs and seeps, and along low gradient reaches. No-harvest riparian buffers on Type 5 streams will be 25 feet wide. In addition, the HCP requires partial-harvest riparian buffers of 50 feet on Type 3 streams and 25 feet on Type 5 streams. These buffers are in addition to and upland of the no-harvest buffers required for these stream types. When conducting partial harvest in Type 3 stream buffers, Tacoma has agreed under the HCP to leave the largest 70 coniferous trees per acre. On Type 5 streams, Tacoma has committed to retaining the largest 50 coniferous trees per acre. All buffers widths will be measured horizontally on both sides of the stream from the ordinary high water mark, channel migration zone, or channel disturbance zone whichever is greater.

Wetland buffers will also vary in width according to the size and type of wetland encountered (See table 5.3 of the HCP). Non-forested wetlands with at least 0.5 acre of open water will receive 100 to 200-foot no-harvest buffers. Non-forested wetlands with less than 0.5 acre of open water with receive 50 to100-foot no-harvest buffers. Forest wetlands described at greater than 30 percent canopy coverage will receive no-harvest buffers varying in width from 25 to 50 feet. All buffers will be measured horizontally from the edge of the wetland.

To reduce impacts of sediment from road construction and maintenance Tacoma will: 1) participate in Watershed Analysis, 2) participate in the development and implementation of a Road Sediment Reduction Plan, 3) implement mass wasting prescriptions from Watershed Analysis for all new road construction, 4) use full bench construction with no side-casting of material on all side slopes greater than 60 percent, 5) mulch and seed all road cuts, 6) maintain locked gates to restrict road access, 7) abandon all roads that are no longer needed for watershed management, forestry, or HCP implementation, and 8) discontinue heavy truck traffic when there is a potential for excessive road damage or water quality impacts. In addition, Tacoma will not construct roads across Type A or B wetlands. These measures combined with riparian buffers

are anticipated to substantially reduce sediment delivery to non-fish and fish-bearing streams, non-forested and forested wetlands, and the reservoir.

Primary Beneficial and Detrimental Effects
Habitat Effects
Covered activities that can influence the amount and quality of Cascades frog habitat include activities related to the management and harvest of timber; road construction, maintenance and use; and the Tacoma's ability to control access to the upper watershed.

The amount of Cascades frog habitat on covered lands is not known, although the species is expected to inhabit covered lands. Where habitat exists on covered lands, normal operations related to timber management and harvest could adversely impact the amount and quality of such habitat. To minimize these impacts, all wetlands will be buffered, except non-forested wetlands smaller than 0.25 acre and forested wetlands smaller than 0.50 acre in the Commercial Zone and parts of the Conservation Zone eligible for harvest. These small wetlands could provide habitat for Cascades frogs, but the amount subject to harvest is undeterminable at this time. To minimize the impact to small wetlands as specified above, such wetlands located in the Natural Zone, stands in the Conservation Zone 100 years old or older, UMAs, or within no-harvest riparian buffers adjacent to streams, will be protected because these areas are not eligible for harvest under terms of the HCP. The majority of wetlands will be preserved or protected by no-harvest riparian buffers.

Sedimentation that results from timber-harvest activities and road construction, maintenance, and use could also adversely affect Cascades frog habitat by filling in all or portions of some non-forested and forested wetlands. Adequate buffering of suitable habitat can ameliorate these effects by filtering sediment before entering wetlands or other water bodies. Under the HCP, non-forested wetlands with an open water portion greater than or equal to 0.50 acre and total size greater than five acres will receive 200-foot no-harvest riparian buffers, and wetlands with an open water portion greater or equal to 0.50 acres and a total size less than 5.0 acres will receive 100-foot no-harvest riparian buffers. Non-forested wetlands with an open water portion less than 0.50 acres and a total size greater than 5.0 acres will receive 100-foot no-harvest riparian buffers, and wetlands with an open water portion less than 0.50 acres and a total size less than or equal to 5.0 acres will receive 50-foot no-harvest riparian buffers. Forested wetlands greater than 5.0 acres will receive 50-foot no-harvest riparian buffers and forested wetlands 0.5 to 5.0 acres will receive 25-foot no-harvest riparian buffers. Non- forested wetlands less than 0.25 acre and forested wetlands less than 0.50 acre will not be buffered.

Under the HCP, Tacoma will implement measures to reduce the amount of sediment being delivered to wetlands and riparian habitats. Tacoma will contribute funds and participate in the development of a Road Sediment Reduction Plan describing the priorities and schedule for road maintenance, improvement, and abandonment activities that will be implemented to reduce road sediment inputs to less than 50 percent of the estimated background sediment production rates as determined by Watershed Analysis. Within two years of the Permit issuance, Tacoma will prepare and prioritize plans to abandon unnecessary existing roads and within five years Tacoma

will complete the abandonment of the roads identified. Tacoma will implement prescriptions developed by Watershed Analysis specific to the construction of new temporary and permanent roads. When constructing roads on side slopes greater than 60 percent, Tacoma will use full bench construction with no side-casting of excavated material. Tacoma will place mulch and grass seed on all road cuts with slopes greater that 40 percent near water crossings, as well as in all locations where there is the possibility of severe erosion or slumping above the road. Where Tacoma has control over road use, they will maintain locked gates to restrict road use by the general public and will also discontinue heavy truck traffic under its control when there is a potential for extraordinary damage to the road or excessive impacts to water quality. In addition, Tacoma will not construct roads across Type A or B wetlands. These measures combined with riparian buffers are anticipated to substantially reduce sediment delivery to non-fish and fish-bearing streams, non-forested and forested wetlands, and the reservoir.

Disturbance Effect

The introduction of aquatic predatory species (e.g. bull frogs) could adversely affect the numbers and distribution of Cascades frogs. Similar introductions are, at least, partially to blame for the precipitous decline of Oregon spotted frogs (McAllister and Leonard 1997, Leonard et al. 1993). To minimize the likelihood that aquatic predators become established or, if present, expand their range in the upper Green River Watershed, Tacoma has committed to maintaining locked gates to restrict road use by the general public.

Other covered activities that could result in the disturbance to or injury of Cascades frog include: timber-harvest and hauling activities; road construction, maintenance, decommissioning and use; road culvert removal, replacement, and maintenance; and silvicultural activities such as planting and thinning. The amount of disturbance to Cascades frogs is expected to be minimal because, covered activities are expected to occur a low levels based on the amount of timber harvest Tacoma engages in on a yearly basis and riparian and wetland protection measures are designed to minimize disturbance to habitat.

Injury/Death

Potential for direct injury or death of Cascades frog is anticipated to be extremely low. Controlled access to the watershed, the reduction of sediment, and the buffering of non-forested wetlands greater than 0.25 acre and forested wetland greater than 0.50 acre are anticipated to adequately protect Cascades frog habitat and minimize the potential for the direct take of Cascades frogs.

Population-Level Effects

The FWS does not anticipate short-term reductions in the baseline of this species to result from the HCP, because the likelihood of incidental take due to habitat modification and disturbance on Tacoma lands under the provisions of the HCP are expected to be very small.

Cascade Torrent Salamander

Adult Cascade torrent salamanders are found in or near streams, springs, and seeps within humid, coniferous forests, from sea level to 4,000 feet. They inhabit the spray zones of waterfalls, seeps that flow through moss-covered gravels or talus, and the splash zones of rocky, tumbling brooks (Larsen 1997). Larvae may be found with adults, but they tend to use slightly deeper water and are abundant in gravel with water percolating through it (Leonard et al. 1993). Cascade torrent salamanders are closely tied to their source of water, but during periods of wet weather they occasionally venture into the surrounding forest (Leonard et al. 1993, Larsen 1997).

Minimization and Mitigation Measures

Tacoma will retain no-harvest riparian buffers along all streams and wetlands within covered lands. No-harvest buffer widths will vary according to stream and wetland types. No-harvest riparian buffers on WDNR Stream Types 1 and 2 will be 200 feet wide. No-harvest buffers on Type 3 streams will be 150 feet wide. No-harvest buffers on Type 4 streams will be 50 feet wide and expand out to100 feet at key locations. These locations are at the origin of Type 4 streams, at headwalls and along steep and unstable slopes, at confluences with other Type 4 streams, at the confluences of Type 4 streams with fish-bearing streams, around springs and seeps, and along low gradient reaches. No-harvest riparian buffers on Type 5 streams will be 25 feet wide. In addition, the HCP requires partial-harvest riparian buffers of 50 feet on Type 3 streams and 25 feet on Type 5 streams. These buffers are in addition to and upland of the no-harvest buffers required for these stream types. When conducting partial harvest in Type 3 stream buffers, Tacoma has agreed under the HCP to leave the largest 70 coniferous trees per acre. On Type 5 streams, Tacoma has committed to retaining the largest 50 coniferous trees per acre. All buffers widths will be measured horizontally on both sides of the stream from the ordinary high water mark, channel migration zone, or channel disturbance zone whichever is greater.

To reduce impacts of sediment from road construction and maintenance Tacoma will: 1) participate in Watershed Analysis, 2) participate in the development and implementation of a Road Sediment Reduction Plan, 3) implement mass wasting prescriptions from Watershed Analysis for all new road construction, 4) use full bench construction with no side-casting of material on all side slopes greater than 60 percent, 5) mulch and seed all road cuts, 6) maintain locked gates to restrict road access, 7) abandon all roads that are no longer needed for watershed management, forestry, or HCP implementation, and 8) discontinue heavy truck traffic when there is a potential for excessive road damage or water quality impacts.

Primary Beneficial and Detrimental Effects

Habitat Effects

Riparian buffers of adequate width provide shade, stabilize stream banks, contribute small and large woody and fine organic matter to maintain instream habitat features, maintain water quality, and improve forest connectivity between streams. Although Cascade torrent salamanders are known to stray into the uplands during periods of heavy rain, they should be expected to be found within streams and saturated stream side areas (Larsen 1997). Cascade torrent salamanders are among the Pacific Northwest's terrestrial salamanders most sensitive to loss of body moisture

(Nussbaum et al. 1983), and therefore, maintaining continuous canopy closure over suitable riparian habitat is essential to this species. All stream segments on covered lands will receive contiguous no-harvest buffers. The total area encompassed by no-harvest riparian buffers in the Natural, Conservation, and Commercial Zones will be 2,125 acres plus an additional 189 acres of partial-harvest riparian buffers. The effective buffer width in the Natural Zone will be greater because the entire zone is no-harvest.

Perennial and seasonal non-fish streams where Cascade torrent salamanders are typically at higher densities (Type 4 and 5 under the HCP and Type N under forest practices rules) receive more protective buffers under Tacoma's HCP than similar waters would receive under current state forest practices rules. Type 4 streams or perennial Type N streams receive 50 to 100 foot no-harvest buffers under Tacoma's HCP. Under current forest practices the same streams would receive a 50-foot buffer over approximately 50 percent of their lengths. Type 5 streams or Type N seasonal streams under Tacoma's HCP receive 25 foot no-harvest and 25 foot partial-harvest buffers. Partial harvest on covered lands consists of retaining the 50 largest coniferous trees per acre of buffer. Similar streams under state forest practices rules may not be buffered at all unless steep and unstable slopes are present. Acres of riparian habitat buffering Type 4 and Type 5 streams where Cascade torrent salamanders are more likely to found totals 417 acres. The effective buffer width in the Natural Zone will be greater because the entire zone is no-harvest.

The age of riparian buffers along streams is also an important. Mature forest cover is considered more beneficial since it contributes to the cool, moist microclimates required by Cascade torrent salamanders. Currently, riparian stands on Tacoma lands range from as young as 6 years old to stand ages exceeding 156 years old, with roughly 50 percent of the stands being 55 years old or less. By 2048 it is projected that all riparian areas will be 55 years of age or older, with 4 percent of these areas exceeding 156 years old.

Welsh and Ollivier (1992) found the density of the three stream amphibian species studied was lower in streams affected by sediment due to road construction than in control streams. Two of three species had significantly lower numbers in all five stream micro habitats evaluated. Macro-invertebrates, the primary food source of juvenile fish and some amphibians, also typically decline when large amounts of sediment are added to the stream system (Furniss et al. 1991). Negative impacts to Cascade torrent salamanders could occur if riparian buffer widths are insufficient to prevent deleterious increases in sediment loads and stream temperatures after timber-harvest activities. On covered lands the potential for this is expected to be low, because of wide buffer widths and the relatively low rates of harvest under the terms of the HCP. On average only 1.5 percent (49 acres) of the Commercial Zone and 2 percent (46 acres) of the Conservation Zone will be harvested in any year during the HCP term and no single harvest unit in the Commercial and Conservation zones will exceed 40 acres and 120 acres, respectively.

Under the HCP, Tacoma will also implement measures to reduce the amount of sediment being delivered to wetlands and riparian habitats. Tacoma will contribute funds and participate in the development of a Road Sediment Reduction Plan describing the priorities and schedule for road maintenance, improvement, and abandonment activities that will be implemented to reduce road

sediment inputs to less than 50 percent of the estimated background sediment production rates as determined by Watershed Analysis. Within two years of the Permit issuance, Tacoma will prepare and prioritize plans to abandon unnecessary existing roads and within five years Tacoma will complete the abandonment of the roads identified. Tacoma will implement prescriptions developed by Watershed Analysis specific to the construction of new temporary and permanent roads. When constructing roads on side slopes greater than 60 percent, Tacoma will use full bench construction with no side-casting of excavated material. Tacoma will place mulch and grass seed on all road cuts with slopes greater that 40 percent near water crossings, as well as in all locations where there is the possibility of severe erosion or slumping above the road. Where Tacoma has control over road use, they will maintain locked gates to restrict road use by the general public and will also discontinue heavy truck traffic under its control when there is a potential for extraordinary damage to the road or excessive impacts to water quality. These measures combined with riparian buffers are anticipated to reduce sediment delivery to non-fish and fish-bearing stream, wetlands, and the reservoir.

Disturbance Effect

Under the HCP, Tacoma will be required to replace culverts where fish passages has been artificially blocked by their road construction and maintenance activities. This activity is schedule to happen during the first seven years of the Permit coverage. Removing and replacing culverts in order to restore fish passage to streams previously blocked by undersized culverts could have a direct impact on Cascade torrent salamanders as fish become re-established in these stream segments. Cascade torrent salamanders will likely continue to persist in these stream segment, but at lower densities. Although these fish restoration actions will have an adverse affect on some individuals of Cascade torrent salamanders, long-term measures to buffer all stream segments on Tacoma lands and reduce sediment loads entering fish and non-fish bearing streams are designed to off-set these impacts.

The introduction of aquatic predatory species (e.g. bull frogs) could adversely affect the numbers and distribution of Cascade torrent salamander. Similar introductions are, at least, partially to blame for the precipitous decline of other amphibian species (McAllister and Leonard 1997, Leonard et al. 1993). To minimize the likelihood that aquatic predators become established or, if present, expand their range in the upper Green River watershed, Tacoma has committed to maintaining locked gates to restrict road use by the general public.

Other covered activities that could result in the disturbance to or injury of Cascade torrent salamander include: timber-harvest and hauling activities; road construction, maintenance, decommissioning and use; road culvert removal, replacement, and maintenance; and silvicultural activities such as planting and thinning. The amount of disturbance to Cascade torrent salamander is expected to be minimal, because covered activities are expected to occur a low levels based on the amount of timber harvest Tacoma engages in yearly and riparian protection measures are designed to minimize disturbance to habitat.

Injury/Death

Potential for direct injury or death of Cascade torrent salamanders is anticipated to be extremely low. Controlled access to the watershed, the reduction of sediment, and the buffering of all fish and non-fishbearing stream segments on covered lands are anticipated to provide adequate protection to Cascade torrent salamander habitat and minimize the potential for the direct take of Cascade torrent salamanders.

Population-Level Effects

The FWS anticipates only a short-term reductions in the baseline of this species to result from the HCP, because the replacement of culverts to correct a man-made fish blockages will result in the decline in some local populations. The HCP is expected to have a net positive effect on Cascade torrent salamanders habitat by protecting existing riparian habitats and allowing it to mature and develop over the term of the HCP.

Coastal Cutthroat Trout

Coastal cutthroat trout found in the Green River have been classified as part of the Puget Sound DPS. This DPS includes populations of coastal cutthroat trout from streams in Puget Sound and the Strait of San Juan de Fuca west to, and including, the Elwha River.

Minimization and Mitigation Measures

Tacoma will provide up-stream fish passage at their diversion facility around HHD for coastal cutthroat trout should they occur releasing them above HHD Reservoir allowing access to spawning habitat in the upper Green River Watershed. Tacoma has also committed to maintaining minimum instream continuous flow in the Green River during summer periods as measured at the Auburn gage. Under Tacoma's First Diversion Water Right claim, Tacoma during wet years has committed under the HCP to maintain 350 cfs at the Auburn gage. During wet to average years, Tacoma will maintain 300 cfs during the summer period. During average to dry years, Tacoma will be required to maintain flows of 250 cfs and during drought years, Tacoma will maintain at least 225 cfs at the Auburn gage (see HCM 1-01 in the HCP). Before withdrawing water under their Second Diversion Water Right, Tacoma will also adhere to seasonal minimum instream flows at the Palmer and Auburn gages. Tacoma will not exercise the Second Diversion Water Right if flows are less than 200 cfs from July 15 to September 15 and 300 cfs from September 16 to July 14 as measured at the Palmer gage. During the period of July 15 to September 15, Tacoma will also not exercise the Second Diversion Water Right when river flows are less than 400 cfs at the Auburn gage (see HCM 1-02 in the HCP).

Tacoma will retain no-harvest riparian buffers along all streams on covered lands. No-harvest buffers widths will vary according to stream type. No-harvest riparian buffers on WDNR Stream Types 1 and 2 will be 200 feet wide. No-harvest buffers on Type 3 streams will be 150 feet wide. No-harvest riparian buffers Type 4 streams will be 50 feet wide and expand out to 100 feet at key locations. These locations are at the origin of Type 4 streams, at headwalls and along steep and unstable slopes, at confluences with other Type 4 streams, at the confluences of Type 4

streams with fish-bearing streams, around springs and seeps, and along low gradient reaches. No-harvest riparian buffers on Type 5 streams will be 25 feet wide. In addition, the HCP requires partial-harvest riparian buffers of 50 feet on Type 3 streams and 25 feet on Type 5 streams. These buffers are in addition to and upland of the no-harvest buffers required for these stream types. When conducting partial harvest on Type 3 stream buffers, Tacoma has agreed under the HCP to leave the largest 70 coniferous trees per acre. On Type 5 streams, Tacoma has committed to retaining the largest 50 coniferous trees per acre. All buffers widths will be measured horizontally on both sides of the stream from the ordinary high water mark, channel migration zone, or channel disturbance zone whichever is greater.

To reduce impacts of sediment from road construction and maintenance Tacoma will: 1) participate in Watershed Analysis, 2) participate in the development and implementation of a Road Sediment Reduction Plan, 3) implement mass wasting prescriptions from Watershed Analysis for all new road construction, 4) use full bench construction with no side-casting of material on all side slopes greater than 60 percent, 5) mulch and seed all road cuts, 6) maintain locked gates to restrict road access, 7) abandon all roads that are no longer needed for watershed management, forestry, or HCP implementation, 8) replace all culverts that block fish passage, and 9) discontinue heavy truck traffic when there is a potential for excessive road damage or water quality impacts that would adversely affect fish.

Primary Beneficial and Detrimental Effects

Habitat Effects

Riparian vegetation provides six specific functions that are essential to the development and maintenance of aquatic habitat favorable to salmonids. Riparian vegetation provides shade to stream channels, contributes large woody debris to streams, adds small organic matter to streams, stabilizes streambanks, controls sediment inputs from surface erosion, and regulates nutrient and pollutant inputs to streams (Spence et al. 1996). The removal of riparian vegetation through logging can diminish these important functions resulting in unfavorable conditions for salmonids and subsequent declines in some populations. Riparian buffering is generally accepted as the most effective way to protect aquatic and riparian habitats (Cummins et al. 1994) and their associated functions. The effectiveness of buffer widths can be best evaluated within the context of specific protection goals (Spence et al. 1996). To provide adequate protection for coastal cutthroat trout, riparian buffers must be of sufficient width to encompass the functions identified above and provide for clear, cold water with complex, connected habitat. Each of these functions have been linked to different buffers widths and the amount of supporting literature associating buffer widths to a particular function is variable.

Stream shading has generally been well studied, and some of the most thorough studies of the effectiveness of riparian buffers and shading have been conducted in the coastal and Cascade ranges of the western U.S. (Spence et al. 1996). Brazier and Brown (1973) found that canopy densities comparable to old growth densities (80% to 90% closure) could be achieved with riparian buffers of 22-30 meters wide (72 - 98 feet). Another study in the western Cascades suggests that riparian buffers greater than 38 meters (125 feet) retain 100 percent of natural shading in coniferous forests (Steinblums et al. 1984). FEMAT (1993) curves suggest that 100

percent shade is achieved at distances of between 25 meters and 39 meters (82 - 128 feet) depending on the height of a site potential tree. Other authors have suggested similar distances for buffers to achieve adequate shading for stream in the coastal and Cascade regions (Murphy 1995, Johnson and Ryba 1992, Beschta et al. 1987). Covered lands in Tacoma's HCP fall within this geographic area thus buffer widths necessary to provided adequate shade are assumed to be comparable. Buffer widths implemented under the HCP will measure 200 feet on a side.

Most of the literature concludes that a majority of the large woody debris entering a stream channel originated from a distance equal to a site potential tree height from the channel margins (Spence et al. 1996). FEMAT (1993) curves indicate that almost all of the large woody debris delivered to an active stream channel comes from one site potential tree height or less. Murphy and Koski (1989) found that 99 percent of all identified sources of large woody debris were within 30 meters from the stream bank (98 feet) for forests in southeastern Alaska. One study conducted in Washington and Oregon identified sources of large woody debris coming from as far way as 50 meters (164 feet) in mature stands and 55 meters (180 feet) in old growth forests (McDade et al. 1990). A review of the literature (Cerderholm1994) showed that recommendations for buffer widths to maintain recruitment of large woody debris ranged from 30 to 60 meters (98-196 feet). Buffer widths implemented under the HCP will measure 200 feet on a side.

Literature identifying buffer widths necessary to provide sufficient amounts of fine organic litter and to make streambanks less susceptible to erosion is not abundant (Spence et al. 1996). FEMAT (1993) assumes that most fine organic matter originates from the first 30 meters (98 feet) of a stream or a distance equivalent to approximately 0.50 of a site potential tree height. Buffers may need to be wider depending on the composition of vegetation adjacent to the stream, but it is generally thought that buffers large enough to maintain 100 percent of large woody debris recruitment and 100 percent of natural shade are also likely to provide approximately 100 percent of fine organic matter (Spence et al. 1996). Buffer widths implemented under the HCP will measure 200 feet on a side.

Spence et al. (1996) also concluded that buffer widths adequate to protect other riparian functions such as large woody debris recruitment and shading are also adequate to provide for stable streambanks. FEMAT (1993) curves indicate that a buffer width equivalent to 0.50 of a site potential tree provides most of the riparian root structure necessary for stable streambanks. Buffer widths implemented under the HCP will measure 200 feet on a side.

The ability of riparian buffers to control sediment inputs from surface erosion are well studied, but not as clearly understood as the other riparian functions. This lack of understanding of these functions have led to riparian buffer recommendations that are extremely variable and reflective of site-specific conditions and the make-up of the sediment and nutrient inputs (Spence et al 1996). For sediment retention, buffer recommendations range from 3 meters to 122 meters (10-400 feet) for agricultural lands (Wilson 1967, Belt et al. 1992), but are somewhat less for forest lands ranging from approximately 15 meters to 90 meters (50-295 feet)(Broderson 1973, Lynch

et al. 1985, Belt et al. 1992). FEMAT (1993) maintains that buffer equivalent to one site potential tree height is probably adequate to control sediments from overland flow.

Similar variation can be observed in studies investigating the up-take of nutrients by riparian buffers. Some evidence indicates that land use can play a major role in determining buffer widths required for the up-take of nutrients (Spence wt al 1996), but existing studies have not provided adequate information for determining effective buffer widths (Belt et al. 1992). A literature review by Spence et. al. (1996) suggested that for most forest lands, buffers designed to protect other riparian functions (large woody debris recruitment, shading) are probably adequate for controlling nutrient inputs to the degree that such increases can be controlled by riparian buffers. Buffer widths implemented under the HCP will measure 200 feet on a side.

Riparian management measures implemented under Tacoma's HCP exceed riparian buffer widths required by state forest practices rules recently modified by the Forests and Fish Report (FWS et al. 1999) and are greater than buffer widths recommended in the literature to achieve properly functioning stream habitats (Spence et al. 1996). Under state forest practices rules, Types S (shorelines of the State) and Type F (waters containing fish habitat other than Type S waters) receive no-harvest buffers of 50-feet (core zone) with partial harvest buffers in the inner and outer zone out to 150 feet. Tacoma's HCP requires no-harvest buffers of 200 feet on Type 1 and 2 streams and 150 feet on Type 3 streams. Type 3 streams on Tacoma's lands will also receive a 50-foot partial-harvest buffer beyond the 150-foot no-harvest buffer. Type 1, 2, and 3 streams are equivalent to Type S and F waters. Under Tacoma's HCP, the effective buffer width in the Natural Zone will be greater because the entire zone is no-harvest.

Perennial and seasonal non-fish streams (Type 4 and 5 under the HCP and Type N under forest practices rules) receive more protective buffers under Tacoma's HCP than similar waters would receive under state forest practices rules. Type 4 streams or perennial Type N streams receive 50 to 100--foot no-harvest buffers under Tacoma's HCP. Under forest practices rules, the same streams would receive a 50-foot buffer over approximately 50 percent of their lengths. Type 5 streams or Type N seasonal streams under Tacoma's HCP receive 25-foot no-harvest and 25 foot partial-harvest buffers. Similar streams under state forest practices rules may not be buffered at all unless steep and unstable slopes are present. The effective buffer width along Type 4 and 5 streams in the Natural Zone will be greater because the entire zone is no-harvest.

In addition to buffer width, the age of stands encompassed by the buffer is important to determine when suitable habitat conditions generally associated with coastal cutthroat trout streams could be achieved. Currently, riparian stands on Tacoma lands range from as young as 6 years old to over 155 years old, with roughly 50 percent of the stands being 55 years old or less. By 2048 it is projected that all riparian areas will be 55 years of age or older, with 4 percent of these areas exceeding 155 years old. A total of 2,125 acres of covered lands will be protected by no-harvest riparian buffers.

The trap and haul facility to be constructed at the Tacoma's Headworks Dam will allow coastal cutthroat trout that may migrated upstream to be captured and released into the upper watershed

above HHD. This will allow any coastal cutthroat trout captured and released access to the upper Green River Watershed (45% of the entire Green River basin) previously blocked since 1913. Habitat conditions in the upper watershed are more favorable for spawning of adult coastal cutthroat trout and the rearing of juveniles than habitat in the lower and middle Green River.

Disturbance Effects

If coastal cutthroat trout are present in the Green River below Tacoma's diversion facility (RM 61.0), the migration of adult coastal cutthroat trout will likely not be prevented by Tacoma's water withdrawals and the associated guaranteed minimum flows at the Auburn and Palmer gages committed to in HCM 1-01 and 1-02. Although the flow commitments were not established for migrating coastal cutthroat trout specifically, they are anticipated to be adequate because these flows were considered sufficient for upstream passage of chinook salmon which spawn during the same late summer to early fall time period. Adult chinook salmon are larger than coastal cutthroat trout and require greater water depths to move upstream over riffles. Based on data collected at riffles in the lower river during the state's instream flow study, water depths in the Green River were determined to be sufficient for upstream passage of chinook when flows at the Auburn gage exceeded 225 cfs. Guaranteed flows under HCM 1-01 will not fall below 225 cfs, and during average and wet years minimum instream flows at the Auburn gage will be 250 and 300 cfs, respectively. Based on the ability of chinook salmon to navigate the Green River when flows at the Auburn gage exceed 200 cfs, it is appropriate to assume that these flows are also adequate for migrating coastal cutthroat trout. Flows to be maintained under the HCP are also higher than minimum flows established by the Washington Department of Ecology (WAC 173-509).

The Tacoma's Headworks facility has prevented the upstream migration of coastal cutthroat trout above RM 61.0 since 1913. The number of coastal cutthroat trout actually prevented from accessing the upper Green River Watershed is unknown. The upstream trap-and-haul facility to be installed at the Headwords diversion dam under HCM 1-03 will provide upstream passage over Tacoma Headworks Diversion and around HHD for any coastal cutthroat trout that reach the Headworks facility during their spawning migration. Since fish will be collected in a trap and transported around HHD by truck, there is a potential for fish to be harmed and possibly killed during this process. The trap and haul facility will be designed to minimize handling and transportation stress to coastal cutthroat trout. Water to water transfer will be used to move fish from the trap to the truck to minimize human handling of fish. The vehicle used to transport the fish will also be specifically designed to minimize human handling of fish. The specific design criteria for the facility and truck will be developed in coordination with the Services as well as state and tribal interests to ensure disturbance to coastal cutthroat trout and salmon will be minimized.

The downstream passage of coastal cutthroat trout at the Headworks facility could potentially harm out-migrating adult and juvenile coastal cutthroat trout. Two routes are currently available to fish migrating downstream over Tacoma's Headworks. The safest of theses two alternatives has been over the existing Headworks facility which is 17 feet high and 150 feet wide. The height of this facility does not alone present a risk to fish passage, but some injury to fish may

occur during certain flows because of the condition of the substrate and channel configuration below the Headworks. One study funded by the COE shows that when fish fall into water, small fish (<100 mm) suffer almost no mortality from falls of up to100 feet and larger fish (>300 mm) do not begin to experience mortality until the height of the fall is over 50 feet (R2 1998). The new Headworks facility will be an additional 6.5 feet high, for a total of 23.5 feet in height and a total of 220 feet wide. The additional height and width are also not anticipated to result in an increased risk of injury or mortality to fish, provided the conditions of the substrate below the Headworks are suitable to prevent injury and adequate water exists (R2 1998). Under HCM 1-04, the channel and landing below the Headworks will be reconfigured to provide a suitable landing pool and adequate water depth that will minimize the effects of the new 23.5 foot fall over the diversion dam. The specifics surrounding the design of the channel below the Headworks will be developed in coordination with the Services as well as others to ensure injury to coastal cutthroat trout and salmon will be minimized.

Alternatively, fish may pass through the Headworks intake. The existing intake screens do not meet current screening standards and may entrain or impinge fish. The Headworks intake currently has a greater potential to kill as compared to passage over the diversion dam. Under HCM 1-04, the new Headworks will incorporate a non-revolving wedgewire screen with trash racks, downstream fish by-pass system, and dual slide gates that will comply with NMFS screening criteria and significantly reduce the risk of entrainment and impingement of fish. The Services will be involved in the final designs of the diversion dam, screens, and fish by-pass system. This measure, including subsequent monitoring, would minimize the potential for take associated with the operation of the intake.

Tacoma's forestry activities in the upper watershed may also adversely affect coastal cutthroat trout. Roads accelerate soil erosion rates because of surface erosion and mass soil movements such as slumps and earth flows, debris avalanches, debris flows, and debris torrents. High rates of stream sedimentation result from this increased erosion. Furniss et al. (1991) found soil erosion rates were 30 to 300 times higher on forests with roads than undisturbed forest. Roads also altered stream-flow rates and volumes, which along with increased sedimentation, resulted in altered stream channel geometry (Furniss et al. 1991). Acting as new flow paths for water, roads increased the channel network over watersheds, increasing the drainage density. Roads have also increased the frequency and magnitude of debris flows, negatively affecting the long-term potential for developing complex channel morphology and aquatic habitat. Shifts in sediment loads set off a complex of channel responses including changes in pool volumes, depth and frequency, and changes channel morphology (including slope, sinuosity, shape, velocity, flooding regime, and sediment transport) (Rhodes et al. 1994).

Roads can also degrade fish habitat by creating migration barriers such as inadequate culverts and temporary blockages caused by road induced landslides. Erosion results in sedimentation of streams and causes declines in spawning habitat when too high a proportion of fine sediment is deposited. Hicks et al. (1991) found that salmonid survival rates decreased after logging and road construction as fine sediment levels in streams increased and as important habitat characteristics, including the number of pools and winter cover, decreased. Macro-invertebrates,

the primary food source of juvenile fish also typically decline when large amounts of sediment are added to the stream system (Furniss et al. 1991).

The introduction of sediment in excess of natural levels can have multiple adverse effects on channel conditions and processes resulting in effects on aquatic species survival, the food web, and water quality conditions, such as water temperature and dissolved oxygen (Rhodes et al. 1994). Fine sediments can influence incubation survival and emergence success (Weaver and White 1985). Emergence success of coastal cutthroat trout has been shown to be approximately 80 percent when no fine materials are present, and approximately 30 percent when 35 percent fine materials are present (Weaver and White 1985). Coastal cutthroat trout preferentially occupy deep pools at all life stages, and few coastal cutthroat trout are found in streams where pools are lacking (Dambacher et al. 1992; Goetz 1989).

To minimize the adverse effects of roads and road use, Tacoma will implement several conservation measures aimed at reducing the amount of sediment entering streams and the HHD Reservoir. Tacoma will contribute funds and participate in the development of a Road Sediment Reduction Plan describing the priorities and schedule for road maintenance, improvement, and abandonment activities that will be implemented to reduce road sediment inputs to less than 50 percent of the estimated background sediment production rates as determined by Watershed Analysis. Within two years of the Permit issuance, Tacoma will prepare and prioritize plans to abandon unnecessary existing roads and within five years Tacoma will complete the abandonment of the roads identified. Within two years, Tacoma will inventory all roads on Tacoma lands to identify and prioritize removal of all artificial barriers that block fish passage. Within five years of the issuance of the Permit, Tacoma will correct the identified blockages and to restore fish passage.

Tacoma will implement prescriptions developed by Watershed Analysis specific to the construction of new temporary and permanent roads. When constructing roads on side slopes greater than 60 percent, Tacoma will use full bench construction with no side-casting of excavated material. Tacoma will place mulch and grass seed on all road cuts with slopes greater that 40 percent near water crossings, as well as in all locations where there is the possibility of severe erosion or slumping above the road. Where Tacoma has control over road use, they will maintain locked gates to restrict road use by the general public and will also discontinue heavy truck traffic under its control when there is a potential for extraordinary damage to the road or excessive impacts to water quality. Where stream crossing are necessary, Tacoma will: 1) minimize the right-of-way crossing, 2) cross streams and riparian corridors at right angles, 3) minimize disturbance to the natural flow, 4) minimize side-casting of excavated material, and 5) provide for upstream and downstream passage of fish if reaches are fish bearing. These measures combined with riparian buffers are anticipated to substantially reduce sediment delivery to non-fish and fish-bearing stream as well as the reservoir.

Injury/Death

Potential for direct injury or death of coastal cutthroat trout is anticipated to be low under the HCP. Flows and riparian buffers widths provided for under the HCP are considered to be

adequate and management-related sediment inputs will be reduced. Take resulting from the construction and operation of upstream and downstream passage facilities at Tacoma's Headworks is expected to be minimized through proper design and monitoring to ensure the facilities are not harming or killing fish. The transport truck will also be designed and operated to minimize the handling of fish, and monitored to ensure it is performing properly and not harming or killing fish.

Population-Level Effects

The FWS anticipates that there will be no reduction in the baseline of this species as a result of implementing of the HCP. Flows in the middle and lower Green River are adequate for chinook and buffers widths are equal or greater than those considered adequate for salmonids. Coastal cutthroat trout could potentially be caught in the trap and haul facility and transported above HHD. Disturbance is anticipated to occur during this process, and such activity may also led to the injury or death of an undetermined number of coastal cutthroat trout. Such take is expected to be minimized through the overall design of the trap and haul facility and transport truck. Resident populations of cutthroat trout are found throughout the upper Green River watershed (USFS 1996). Although genetic testing has not been conducted, it is likely these resident trout are related to anadromous populations that were cut off from the upper watershed by the construction of Tacoma Headworks in 1911. Overall, the population may benefit from providing some coastal cutthroat trout access to the upper watershed. Suitable spawning habitat does not likely exist in the lower and middle Green River, but likely occurs above HHD. Reestablishing coastal cutthroat trout above the dam would increase local populations and expand the known range of the Puget Sound DPS.

Common Loon

Common loons typically breed on forested lakes with deep inlets or bays and numerous islands (McIntyre and Barr 1977). In Washington, the size of suitable lakes ranges from 19 acres to 7800 acres (WDFW 2000). Two areas, Eagle Lake and HHD Reservoir, are the only known sites on covered lands where common loons have been observed breeding and nesting. Common loons nest on the ground near water, small islands, floating mats of vegetation, and artificial platforms (WDFW 2000). They need an adequate prey base and forage primarily in shallow, clear water (WDFW 2000). Common loons can be negatively affected by human presence. In one study, common loons that experienced fewer human contacts were observed to produce more surviving young (Titus and VanDuff 1981). Shoreline walkers, canoeists, motorboats, jet skiers can disrupt normal common loon behavior patterns (WDFW 2000).

Minimization and Mitigation Measures

Wetlands, including lakes large enough to support breeding and nesting by common loons will be protected by 200-foot no-harvest riparian buffer. HHD Reservoir will also be protected by, at least, a 200-foot no-harvest riparian buffer. Since the reservoir is totally encompassed by the Natural Zone, the no-harvest buffer is wider than 200 feet in most areas.

Access to covered lands is controlled by Tacoma. The general public is prohibited from entering the watershed between Tacoma's Headworks and the old town site of Lester. This closure is sufficient to prevent access to water bodies in the Watershed either known to have nesting common loons or of sufficient size to support nesting common loons. Tacoma owns the lands surrounding both the reservoir and Eagle Lake.

Tacoma will reduce fine sediments from entering water bodies by maintaining no-harvest buffers on all streams, lakes, and the reservoir and by implementing measures to reduce erosion from existing and proposed roads. Reducing sediment will improve fish habitat for prey species and increase visibility for loons.

The reintroduction of salmonids into the upper watershed will enhance the existing food base of breeding and wintering loons in the HHD Reservoir. Adults will be transported around Tacoma's diversion dam and released above HHD to spawn. Juvenile salmon will move downstream into the reservoir and be available to nesting common loons.

Primary Beneficial and Detrimental Effects

Habitat Effects

Minimization and mitigation measures will result in positive benefits for common loons in the upper watershed by protecting and buffering all water bodies capable of supporting breeding, nesting, and wintering common loons with a 200-foot no-harvest riparian buffer or greater, and maintaining locked gates to restrict road use and use of lakes and the reservoir by the general public. The reintroduction of adult salmon and bull trout into the upper watershed will also provide additional forage for common loons in the form of juveniles.

Disturbance Effects

Principle threats to common loons include habitat loss and degradation from development, human influences on lake water levels, disturbance from boaters and fishers, entanglement in fishing lines, and the ingestion of fishing equipment (Richardson et al. 2000). Most of these threats are not realized in the upper watershed because the watershed is closed and will remain closed to the public under terms of the HCP. Disturbance to common loons resulting from timber-harvest activities will be minimized by maintaining a 200-foot buffer around all large bodies of water on covered lands. Sediment from timber harvest and road construction, use, maintenance, and abandonment on covered lands could reduce the quality and quantity of available common loon habitat by filling in emergent wetlands on the periphery of larger water bodies and reducing water clarity.

To minimize the adverse effects of roads and road use, Tacoma will implement several conservation measures aimed at reducing the amount of sediment entering streams, lakes, wetlands, and the HHD Reservoir. Tacoma will contribute funds and participate in the development of a Road Sediment Reduction Plan describing the priorities and schedule for road maintenance, improvement, and abandonment activities that will be implemented to reduce road sediment inputs to less than 50 percent of the estimated background sediment production rates as determined by Watershed Analysis. Within two years of the Permit issuance, Tacoma will

prepare and prioritize plans to abandon unnecessary roads and within five years Tacoma will complete the abandonment of the roads identified. Tacoma will implement prescriptions developed by Watershed Analysis specific to the construction of new temporary and permanent roads. When constructing roads on side slopes greater than 60 percent, Tacoma will use full bench construction with no side-casting of excavated material. Tacoma will place mulch and grass seed on all road cuts with slopes greater that 40 percent near water crossings, as well as in all locations where there is the possibility of severe erosion or slumping above the road. Where Tacoma has control over road use, they will maintain locked gates to restrict road use by the general public and will also discontinue heavy truck traffic under its control when there is a potential for extraordinary damage to the road or excessive impacts to water quality. These measures combined with riparian buffers are anticipated to substantially reduce sediment delivery to non-fish and fish-bearing stream as well as the reservoir and lakes capable of supporting common loons, thereby maintaining the function and quantity of existing common loon habitat on covered lands.

Water levels behind HHD can vary substantially dropping one hundred feet or more in a year. Although such drops in water levels can be detrimental to nesting common loons, this activity is mainly a COE action and the effects on common loons would be addressed under a Section 7 consultation if the common loon were to become listed.

Injury/Death
Potential of direct injury or death of common loons is anticipated to be extremely low. Under the HCP, Tacoma is committed to protecting and buffering all water bodies capable of supporting breeding, nesting, and wintering common loons, maintaining locked gates to restrict road use and use of lakes and the reservoir by the general public, and restoring salmon and bull trout to the upper watershed which will provide additional forage for common loons.

Population-Level Effects
The FWS does not anticipate short-term reductions in the baseline of this species to result from the HCP, because the likelihood of incidental take due to habitat modification and disturbance on Tacoma lands under the provisions of the HCP are expected to be small.

Larch Mountain Salamander

The Larch Mountain salamander was thought to be only associated with steep talus slopes or rocky substrates covered with mosses and dense overstory of coniferous trees(Leonard et al. 1993; Herrington and Larsen 1993). More recent investigations have revealed that the Larch Mountain salamander is associated with a much broader array of habitat types. Habitat features associated with some or all of these habitat types include rocky substrates, shrubs, herbs, mosses, woody debris, and rocks. This species has typically been thought of as an upland species, but they have also been found near streams where the vegetation is dominated by upland associations (Olson et al. 1999).

Mitigation and Minimization Measures

All potential habitat for Larch Mountain salamander in the Natural Zone and in those areas in the Conservation Zone where stand age is currently 100 years old or older will be protected under Tacoma's HCP. As other stands in the Conservation Zone reach 100 years old, they will be protected from additional harvest. Covered lands in the Natural Zone will not be harvested during the life of the HCP, therefore, all talus slopes other rocky substrate will remain undisturbed and the canopy coverage will be retained and continue to mature. Covered lands in the Conservation Zones with stand ages of 100 years old or older will be managed the same as the Natural Zone, meaning all existing talus slopes and other rocky substrates will be protected and overstory trees will be retained and continue to mature and provide shade over the permit term. Other covered lands in the Conservation Zone will be managed under an uneven-aged harvest regime which will retain 50 or greater dominant and co-dominant trees per acre. The purpose of the uneven-aged harvest is to enhance or accelerate mature and late-seral forest conditions which will also provide adequate canopy coverage over suitable substrates. No timber harvest will occur once these stands reach 100 years old. This will allow stands to develop mature and late-seral conditions through natural succession.

In areas where Tacoma proposes to conduct timber harvest and other activities that would reduce forest cover, remove or disturb coarse woody debris, or substantially disturb coarse, unconsolidated substrate; Tacoma will survey potential Larch Mountain salamander habitat and protect occupied habitats. Habitat found to be occupied by Larch Mountain salamander will be protected and buffered with 50-foot no-harvest buffers. New roads will be rerouted around occupied habitat unless the new road would be substantially longer or the alternate location would have greater impacts to fish and wildlife. The total area protected per planned project activity (e.g. harvest unit, road segment) can not exceed 10 percent of the project footprint. When occupied habitat covers more than 10 percent of the area, Tacoma and FWS will determine which areas will receive protection under this measure. Also during harvest activities in the Commercial Zone, Tacoma has committed to retain four downed logs per acre harvested. Downed logs are used by Larch Mountain salamanders as cover structures (Crisafulli 1998).

Primary Beneficial and Detrimental Effects

Habitat Effects

All potential habitat for Larch Mountain salamander in the Natural Zone and in those areas in the Conservation Zone where stand age is currently 100 years old or older will be protected under Tacoma's HCP. As other stands in the Conservation Zone reach 100 years old, they will be protected in a similar manner. Forested acres in the Natural and Conservation zones total 8,701 acres. In areas where Tacoma plans to harvest timber or conduct timber related activities, Tacoma will survey potential Larch Mountain salamander habitat, and if potential habitat is determined to be occupied by Larch Mountain salamanders, it will be protected and buffered by 50-foot no-harvest buffers. When occupied habitat covers more than 10 percent of a harvest unit, Tacoma and FWS will determine which areas are to receive protection under the terms of conservation measure HCM-3-04U written for Larch Mountain salamanders. A 50-foot buffer will encircle all occupied habitat that is identified for protection. All other Larch Mountain salamander habitat within a harvest unit would be impacted by harvest-related activities.

No-harvest buffers along streams on Tacoma HCP lands, will result in the protection of 2,125 acres of riparian forest ranging from 25 feet to 200 feet in width and provide contiguous buffers along all stream segments bordering Tacoma lands. Partial-harvest buffers on Type 3 and 5 streams will result in an additional 189 acres of potential habitat. Habitat features associated with Larch Mountain salamanders that are adjacent to wetland and along streams will be protected by riparian buffers, and the buffers will continue to mature providing additional canopy cover and large woody debris.

Disturbance Effects

Potential and occupied Larch Mountain salamander habitat in the Commercial Zone and portions of the Conservation Zone eligible for harvest could be disturbed during timber harvest and harvest related activities. Although the HCP will require Tacoma to survey all potential Larch Mountain salamander habitat and buffer occupied habitat prior to ground disturbing activities, the total occupied habitat to be buffered in any harvest unit is not required to exceed 10 percent of the harvest unit's total area. When occupied habitat covers more than 10 percent of a harvest unit, Tacoma and FWS will determine which areas are to receive protection under the terms of conservation measure HCM-3-04U written for Larch Mountain salamanders. A 50-foot buffer will encircle all occupied habitat that is identified for protection. All other Larch Mountain salamander habitat within in a harvest unit would be disturbed by harvest-related activities. On average only 1.5 percent (49 acres) of the Commercial Zone and 2 percent (46 acres) of the Conservation Zone will be harvested in any year during the HCP term minimizing the amount of disturbance to one to two entries per year.

Injury/Death

Potential for direct injury or death of Larch Mountain salamanders is anticipated to be extremely low. Potential habitat in the Commercial Zone and portions of the Conservation Zone subject to harvest will be surveyed and, if occupied by Larch Mountain salamanders, will be buffered. Potential and occupied habitats in the Natural Zone and portions of the Conservation Zone are not subject to harvest, and subsequently will be protected. In addition, all streams on Tacoma lands will be protected by continuous no-harvest buffers providing additional means of protecting habitat.

Population-Level Effects

The FWS anticipates only a short-term reduction in the baseline of this species to result from the HCP because there is a potential that some occupied habitat could be adversely impacted during harvest-related activities. However, it is expected that the most suitable habitat will not be subject to timber harvest. Throughout its 50 year term, the HCP is expected to have a net positive effect on Larch Mountain salamander and contribute to improvements in its status both locally and regionally by protecting existing habitat on covered lands in the upper Green River Watershed.

Northern Goshawk

Northern goshawks are not known to nest on covered lands, but conversely there has been no comprehensive surveys on covered lands or in the Green River Watershed to determine northern goshawk nesting. Given the number of sightings of northern goshawks in the watershed (USFS 1997), it is reasonable to assume northern goshawk nesting occurs on and near covered lands.

Mitigation and Minimization Measures

Minimization and mitigation measures for northern goshawks include the protection and establishment of mature and late-seral coniferous forest conditions suitable for northern goshawk nesting in the Natural and Conservation Zones as well as in UMAs and riparian buffers. Coniferous forests in the Natural Zone, stands greater than 100 years old in the Conservation Zone, UMAs, and no-harvest riparian buffers will be allowed to develop without intervention over the life of the permit. The remaining lands in the Conservation Zone will be managed to accelerate the development of late-seral and mature coniferous forest conditions. Once these stands reach the age of 100 years, no additional timber-harvest activities will be allowed under the HCP.

Seasonal timing and nest protection measures will be implemented for all covered activities that could potentially disturb nesting northern goshawks. Under seasonal restrictions, Tacoma will not conduct timber felling, yarding, or road construction within 0.25 mile, use of helicopters for commercial timber harvest and silvicutural activities within 0.50 mile, or blast within 1.0 mile of any known active northern goshawk nest annually from March 1 through August 31. Tacoma will conduct no timber felling or other habitat alterations within 660 feet of any known active northern goshawk nest in the watershed, unless it has been determined that a nest has been unoccupied for 8 consecutive years.

Primary Beneficial and Detrimental Effects

Habitat Effects

Considerable acreage of mature and late-seral forests capable of supporting northern goshawk nesting is expected to develop in the Natural and Conservation Zones and to a lesser extent in the UMAs and riparian buffers. Over the 50 year life of the HCP, the total amount of mature coniferous forest (106 to 155 years old) on Tacoma lands is anticipated to increase from 268 acres to 4,027 acres. In addition, the total amount of late-seral coniferous forests (>155 years old) is expected to increase from 41 acres to 292 acres. By permit expiration, 82 percent of the late-seral forest (238 of 292 acres) and 64 percent of the mature forest (2,593 of 4,027) will be in the Natural Zone. Five percent (15 acres) of late-seral forest and 29 percent (1,161 acres) of mature forest will be in the Conservation Zone. The remaining 13 percent (39 acres) of late-seral and 7 percent (272 acres) of mature forest will be contained in UMAs and riparian buffers. All existing habitat in the Natural Zone, stands in the Conservation Zone 100 years old or older, UMAs, and no-harvest riparian buffers will not be harvested during the HCP term. Non-habitat in these reserve areas will also not be subject to harvest, and therefore, will continue to mature and develop into suitable northern goshawk habitat

Acreage considered suitable for foraging will experience significant increase across all three zones of the covered lands. Over the term of the HCP, the total amount of habitat 36 years old or older is expected to increase from its current 5002 acres to 8360 acres. A considerable amount of Tacoma's ownership is currently suitable foraging habitat for northern goshawks and additional acreage will develop over the life of the HCP.

Under the HCP, Tacoma will manage 3,858 acres of their lands for commercial timber harvest. Excluding riparian buffers and UMA, there are approximately 3,285 acres of the 3,858 acres available for commercial harvest. The objective of this zone is to grow and harvest timber commercially on a sustainable basis. These stands will be managed on a 70 year, even-aged rotation. Forest stands eligible for harvest in the Commercial Zone contain some habitat suitable for nesting northern goshawks. There are currently 703 acres of coniferous forest 76 to 105 years old and 97 acres of coniferous forest 106 to 155 years old in the Commercial Zone. Over the term of the HCP, stands in the 76 to 105 year old age class will decrease to 50 acres while stands in the 106 to 155 year old age class will increase to 268 acres with an addition 39 acres exceeding 155 year of age. This represents a net decrease of approximately 346 acres of suitable habitat in the Commercial Zone over the 50 year term of the HCP. Losses in habitat are expected to be off-set by the overall gain in forests of 106 years old or older from 309 acres to 4,319 acres. The Commercial Zone will also provide suitable foraging habitat over most of the 3,285 acres over the permit term because of extended rotations (70 years) and the small amount of timber harvest annually (on average 49 acres).

Disturbance Effects

Some disturbance of northern goshawk is anticipated as a result of implementing the HCP. Primary activities that could result in disturbance and ultimately led to take of northern goshawks include uneven-aged harvest activities in stands in the Conservation Zone, even-aged harvest in the Commercial Zone, road management and use including road abandonment and decommissioning, and other silvicultural activities such as planting, pruning, thinning, salvage harvesting, and hardwood conversion.

In the Conservation Zone, stands less than 100 years of age will be subject to an uneven-aged harvest regime for the purposes of accelerating or enhancing the development of late-seral forest characteristics. Periodic commercial thinning prior to stands reaching 100 years old will occur on approximately 2,000 acres, and has the potential to temporarily disturb or displace northern goshawks. Once these stands reach 100 years of age, no additional timber harvest will be conducted and, consequently, there should be no additional harvest-related disturbance to northern goshawks. Tacoma will look for evidence of northern goshawks and northern goshawk nests prior to harvest of stands with suitable northern goshawk habitat or that are adjacent to suitable northern goshawk habitat. When covered activities do occur in the Conservation Zone, timing restrictions agreed in HCM 3-04Q in the HCP and the nest protection measure agreed to in HCM 3-04R in the HCP will be implemented. Timing restrictions will prevent Tacoma from harvesting during the nesting season. The nest protection measure will maintain habitat immediately surrounding the nest (31 acres), but allow for uneven-aged harvest or thinning to occur outside the nesting period to accelerate the development of mature and late-seral forest

conditions in the Conservation Zone. Over the 50 year term of the HCP, on average no more than 2 percent (46 acres) of the coniferous stands in the Conservation Zone will be harvested in any year, corresponding to one or two entries annually. Thus, the potential for disturbance to northern goshawks is expected to be small.

In the Commercial Zone, stands outside of no-harvest riparian buffers and UMAs will be subject to even-aged harvest with a rotation of 70 years. Tacoma will look for evidence of northern goshawks and northern goshawk nests prior to harvest of stands with suitable northern goshawk habitat or that are adjacent to suitable northern goshawk habitat. If present, seasonal timing restrictions and nest protection measures described previously will be implemented. Timing restrictions will prevent disturbance to northern goshawks during the nesting period and nest protection measure will maintain a 31-acre buffer around nests during the non-breeding season. This buffer strategy is not designed to maintain a nest over the long-term in the Commercial Zone, but reduce direct impacts to active nests and allow for the transition of northern goshawks to unoccupied habitat in the Natural and Conservation Zones, UMAs, and potentially riparian buffers. These areas are specifically managed to protect existing suitable northern goshawk habitat and develop additional habitat over the term of the permit. Although Tacoma is expected to disturb nesting northern goshawks in Commercial Zone, such disturbance is anticipated to be infrequent because the amount and rate of harvest is small. On average only 1.5 percent (49 acres) of the Commercial Zone will be harvested in any year during the HCP term, which corresponds to one or two entries annually.

Other silvicultural activities such as planting, pruning, thinning, salvage harvesting and hardwood conversion are not anticipated to significantlly disturb northern goshawks. Salvage harvesting under the HCP will not occur in stands in the Natural Zone and stands in the Conservation Zone of 100 years old or older. Activities such as planting, pruning, thinning, and hardwood conversion generally occur in stands incapable of northern goshawk nesting. When silvicultural activities such as planting, pruning, thinning, salvage harvesting and hardwood conversion are conducted near known nesting sites, timing restrictions agreed in HCM 3-040 in the HCP will be implemented.

Road construction, management, and use implemented according to the HCP could, in some instances, result in disturbance to northern goshawks. Tacoma will continue to construct roads in all three zones of their ownership to facilitate watershed operations and forest management activities. To minimize impacts to northern goshawks that may result from road construction, maintenance, and use as described in the HCP, Tacoma has committed to remove other unnecessary roads and will cause no net increase of roads in the Natural Zone. In addition, Tacoma has also committed to maintain locked gates to restrict public access to the upper watershed, thereby reducing the disturbance of northern goshawks due to frequent vehicle traffic. When road construction, management, and use occur near known nest sites, timing restrictions agreed in HCM 3-04Q in the HCP and the nest protection measure agreed to in HCM 3-04R in the HCP will be implemented.

Injury/Death

Potential of direct injury or death of northern goshawks is anticipated to be extremely low. Under the HCP, Tacoma has committed to protecting the majority of the northern goshawk habitat and increasing the amount of suitable habitat on its ownership over the term of the HCP. To further minimize the likelihood of direct injury or death to northern goshawks, Tacoma will implement seasonal timing restrictions around known nesting pairs. There is a potential that unknown nests could be accidentally destroyed during timber harvest in the Conservation and Commercial Zones. However, this is expected to be low because Tacoma has committed to look for evidence of northern goshawks and northern goshawk nests prior to harvest of stands with suitable northern goshawk habitat or that are adjacent to suitable northern goshawk habitat.

Population-Level Effects

The FWS does not anticipate short-term reductions in the baseline of this species to result from the HCP, because the likelihood of incidental take due to habitat modification and disturbance on Tacoma lands under the provisions of the HCP are expected to be small. To accomplish this, Tacoma under terms of the HCP, is expected to protect all existing active northern goshawk sites and grow additional suitable habitat over the life of the HCP.

Northwestern Pond Turtle

Northwestern pond turtles have been found in marshes, ponds, sloughs and small lakes in Washington (Slater 1939). They need large objects such as logs and rocks for basking. They are most abundant where there is shallow water covered with vegetation. Northwestern pond turtles are easily disturbed, and therefore, require adequate cover to hide. During winter months, they hibernate by burying themselves into sand or mud.

Minimization and Mitigation Measures

Wetland buffers will vary in width according to the size and type of wetland encountered (See table 5.3 of the HCP). Non-forested wetlands with at least 0.5 acre of open water will receive 100 to 200-foot no-harvest buffers. Non-forested wetlands with less than 0.5 acre of open water will receive 50 to 100-foot no-harvest buffers. Forest wetlands described as greater than 30 percent canopy coverage will receive no-harvest buffers varying in width from 25 to 50 feet. All buffers will be measured horizontally from the edge of the wetland. The effective wetland buffer width in the Natural Zone will be greater because the entire zone is no-harvest.

Tacoma will also develop site-specific protection plans to minimize impacts to northwestern pond turtles, if they are found to occur on covered lands and its is determined that one or more of the covered activities has the potential to impact them. These plans will be developed cooperatively with FWS and WDFW and will be in addition to wetland buffers established under the HCP.

To reduce impacts of sediment from road construction and maintenance Tacoma will: 1) participate in Watershed Analysis, 2) participate in the development and implementation of a

Road Sediment Reduction Plan, 3) implement mass wasting prescriptions from Watershed Analysis for all new road construction, 4) use full bench construction with no side-casting of material on all side slopes greater than 60 percent, 5) mulch and seed all road cuts, 6) maintain locked gates to restrict road access, 7) abandon all roads that are no longer needed for watershed management, forestry, or HCP implementation, 8) discontinue heavy truck traffic when there is a potential for excessive road damage or water quality impacts.

Primary Beneficial and Detrimental Effects

Habitat Effects

All potential northwestern pond turtle habitat in the Natural Zone and portions of the Conservation Zone excluded from harvest will be protected. Additional habitat in the Commercial Zone and portions of the Conservation Zone eligible for harvest will be buffered with 50 to 200-foot no-harvest buffers. If northwestern pond turtles are found to occupy a wetland, additional measures agreed upon by Tacoma and the FWS will be implemented to protect northwestern pond turtles and their habitat on covered lands from human disturbance, alteration, and destruction.

Under the HCP, Tacoma will also implement measures to reduce the amount of sediment being delivered to wetlands and riparian habitats. Tacoma will contribute funds and participate in the development of a Road Sediment Reduction Plan describing the priorities and schedule for road maintenance, improvement, and abandonment activities that will be implemented to reduce road sediment inputs to less than 50 percent of the estimated background sediment production rates as determined by Watershed Analysis. Within two years of the Permit issuance, Tacoma will prepare and prioritize plans to abandon unnecessary existing roads and within five years Tacoma will complete the abandonment of the roads identified. Tacoma will implement prescriptions developed by Watershed Analysis specific to the construction of new temporary and permanent roads. When constructing roads on side slopes greater than 60 percent, Tacoma will use full bench construction with no side-casting of excavated material. Tacoma will place mulch and grass seed on all road cuts with slopes greater that 40 percent near water crossings, as well as in all locations where there is the possibility of severe erosion or slumping above the road. Where Tacoma has control over road use, they will maintain locked gates to restrict road use by the general public and will also discontinue heavy truck traffic under its control when there is a potential for extraordinary damage to the road or excessive impacts to water quality. In addition, Tacoma will not construct roads across Type A or B wetlands. These measures combined with riparian and wetland buffers are anticipated to substantially reduce sediment delivery to non-fish and fish-bearing streams, wetlands, and the reservoir.

Disturbance Effect

The introduction of aquatic predatory species (e.g. bull frogs) has been identified as a threat to the northwestern pond turtle populations in Washington (Larsen 1997). To minimize the likelihood that aquatic predators become established or, if present, expand their range in the upper Green River Watershed, Tacoma has committed to maintaining locked gates to restrict road use by the general public.

Other covered activities that could result in the disturbance to or injury of Northwestern pond turtles include: timber-harvest and hauling activities; road construction, maintenance, decommissioning and use; road culvert removal, replacement, and maintenance; and silvicultural activities such as planting and thinning. The amount of disturbance to northwestern pond turtles is expected to be minimal because turtles are currently not known to occur in the watershed, and covered activities are expected to occur at low levels based on the amount of timber harvest annually.

Injury/Death

Potential for direct injury or death of northwestern pond turtle is anticipated to be extremely low. Controlled access to the watershed, the reduction of sediment, and the buffering of potential habitat are anticipated to minimize the potential for the direct take of northwestern pond turtle should they be found to inhabit the plan area. In addition, Tacoma and the FWS will develop site-specific plans to protect northwestern pond turtles and their habitat, if they are found on covered lands. These protections will be in addition to wetland buffers required under the HCP.

Population-Level Effects

The FWS does not anticipate short-term reductions in the baseline of this species to result from the HCP, because the likelihood of incidental take due to habitat modification and disturbance on Tacoma lands under the provisions of the HCP are expected to be rare. The northwestern pond turtle are not currently known to inhabit wetlands on covered lands or the larger Green River Watershed. Based on the current known population distribution it is unlikely that northwestern pond turtle will colonize wetlands in the upper Green River Watershed.

Olive-sided Flycatcher

Olive-sided flycatchers are generally found in open, mature stands of conifers, or along the edges of clearings created by burns, wind throw, wetlands, and clearcuts where high perches in tall trees and snags are available (Harrison 1979, Brown 1985, Sharp 1992). Nests are usually built 7 to 72 feet above ground in conifers and territories are about 25 acres (Sharp 1992). In Washington, olive-sided flycatcher habitat has been described as patches of large trees adjacent to cleared areas, burns and water bodies (Dvornich et al. 1997). In California, higher densities of olive-side flycatchers were reportedly associated with saplings (0-20 years) and mature forest (>80 years) rather than forests between 20 and 80 years old (Raphael et al. 1988).

Minimization and Mitigation Measures

Minimization and mitigation measures for olive-sided flycatcher include the protection and establishment of mature and late-seral coniferous forest conditions in the Natural and Conservation Zones as well as, but to a lesser extent, in UMAs and riparian buffers. Coniferous forests in the Natural Zone, stands greater than 100 years old in the Conservation Zone, UMAs, and riparian buffers will be allowed to develop without intervention over the life of the permit, while the remaining lands in the Conservation Zone will be managed to accelerate the development of late-seral and mature coniferous forest conditions. Once these stands reach the age of 100 years, no additional timber-harvest activities will be allowed under the HCP.

During the harvest of timber in the Commercial Zone and those portions of the Conservation Zone less than 100 years old, Tacoma has committed to retain all safe snags, a minimum of four green recruitment trees, and four logs per acre harvested. If at least six suitable snags as defined in HCM 3-01G in the HCP are not available per acre harvested, additional green recruitment trees will be retained at a ratio of 1 to 1. If less that two snags are available per acre, Tacoma will actively create 2 snags per acre from 2 of the larger green recruitment trees. This measure will be adaptively managed to ensure snags adequate for perches will be part of the landscape on covered lands subject to harvest. All snags will be retained in the Natural Zone, stands in the Conservation Zone 100 years old or older, UMA, and no-harvest riparian buffers, except danger trees within 150 feet of active roads.

Primary Beneficial and Detrimental Effects

Habitat Effects

Considerable acreage of mature and late-seral forests capable of supporting nesting by olive-sided flycatcher is expected to develop in the Natural and Conservation Zones and to a lesser extent in the UMAs and riparian buffers. Over the 50 year life of the HCP, the total amount of mature coniferous forest (106 to 155 years old) on Tacoma lands is anticipated to increase from 268 acres to 4,027 acres. In addition, the total amount of late-seral coniferous forests (>155 years old) is expected to increase from 41 acres to 292 acres. By permit expiration, 82 percent of the late-seral forest (238 of 292 acres) and 64 percent of the mature forest (2,593 of 4,027) will be in the Natural Zone. Five percent (15 acres) of late-seral forest and 29 percent (1,161 acres) of mature forest will be in the Conservation Zone. The remaining 13 percent (39 acres) of late-seral and 7 percent (272 acres) of mature forest will be contained in UMAs and riparian buffers. In addition, neither the UMAs or riparian buffers will be subject to timber harvest during the life of the HCP, except the partial harvest portion of both Type 3 and Type 5 streams.

With the increase of late-seral and mature forest from 309 acres to 4,319, it is anticipated the number and size of snags will also increase. Because there will be no commercial harvest in the Natural Zone, stands in the Conservation Zone 100 years old or older, in UMAs, and in no-harvest riparian buffers, existing snags will continue to persist and new snags will develop over the life of the HCP. In the Commercial Zone, the portions of the Conservation Zone less than 100 years old, and partial-harvest riparian buffers, Tacoma has committed to retain all safe snags, a minimum of four green recruitment trees, and four logs per acre harvested. If at least six suitable snags as defined in HCM 3-01G are not available per acre harvested, additional green recruitment trees will be retained at a ratio of 1 to 1. If less that two snags are available per acre, Tacoma will actively create 2 snags per acre from green recruitment trees. This measure will be adaptively managed to ensure snags and large green recruitment trees suitable for perches will be part of the landscape on covered lands subject to harvest. Snags are an important habitat feature used by olive-side flycatchers for perching while sallying for insects.

There are currently 703 acres of coniferous forest 76 to 105 years old and 97 acres of coniferous forest 106 to 155 years old in the Commercial Zone. Over the term of the HCP, stands in the 76 to 105 year old age class will decrease to 50 acres while stands in the 106 to 155 year old age class will increase to 268 acres with an addition 39 acres exceeding 155 years of age. This

represents a net decrease of 346 acres of mature forest habitat in the Commercial Zone over the 50 year term of the HCP. Losses in habitat are expected to be off-set by the overall gain on covered lands of forests 106 years old or older from 309 acres to 4,319 acres. In addition, harvest activities in the Commercial Zone will provide openings and stands of saplings that have been shown to be preferentially utilized by olive-sided flycatchers (Harrison 1979, Brown 1985, Sharp 1992, Raphael et al. 1988). Tacoma will retain all safe snags and a minimum of four green recruitments trees per acre to provide potential perches and nest sites in harvested areas for olive-sided flycatchers.

Disturbance Effects

Covered activities under the HCP that may disturb or otherwise injure olive-sided flycatchers include even-aged timber harvest in the Commercial Zone, uneven-aged harvest in the Conservation Zone, road management, use, and abandonment, and silvicultural activities such as planting, pruning, thinning, salvage harvesting, and hardwood conversion.

In the Conservation Zone, stands less than 100 years of age will be subject to an uneven-aged harvest regime for the purposes of accelerating or enhancing the development of late-seral forest characteristics. Such activities may result in temporary disturbance to olive-sided flycatchers, but these effects are expected to be short-lived. The effects on habitat are also anticipated to be short-lived. Some nests can be expected to be disturbed or removed during timber harvest. Over the 50 year term of the HCP, areas in the Conservation Zone that are subject to uneven-aged harvest are expected to develop late-seral forest with small openings suitable for use by olive-sided flycatchers. No more than 2 percent (46 acres) of the coniferous stands in the Conservation Zone will be harvested in any year, corresponding to 1 to 2 entries per year.

Under the HCP, Tacoma will manage 3,858 acres of their lands for commercial timber harvest. Forest stands eligible for harvest in the Commercial Zone could currently provide habitat for olive-sided flycatchers. Harvest activities may result in temporary disturbance of olive-sided flycatchers, but this disturbance is expected to be short-lived as olive-sided flycatchers are known to utilize clearcuts as well as mature forests (Raphael et al. 1988). Some nests can be expected to be disturbed or removed during timber harvest. Impacts due to timber harvest are expected to be infrequent since, on average, no more than 1.5 percent (49 acres) of the coniferous stands in the Commercial Zone will be harvested in any year, corresponding to only 1 to 2 entries per year.

Injury/Death

Potential of direct injury or death of olive-sided flycatcher is anticipated to be low. Under the HCP, Tacoma will protect existing mature and late-seral forests in the Natural Zone, portions of the Conservation Zone that are 100-years old or older, UMAs, and no-harvest riparian buffers. The amount of this habitat will increase from its current 309 acres to 4,319 acres. There is a potential that an unknown number of nests with young could be accidentally disturbed or destroyed during timber harvest in the Conservation and Commercial Zones, but the amount of habitat removed from these zones in a year will average only one to two percent of the total amount of habitat available in these two zones.

Population-Level Effects

The FWS anticipates only short-term reductions in the baseline of this species to result from the HCP and the potential for the incidental take of olive-sided flycatcher due to habitat modification, and disturbance on Tacoma lands under the provisions of the HCP to be small. Increases in habitat function and quantity can accommodate an increase in population size and improve productivity on covered lands and in the Upper Green River Watershed. Late-seral and mature coniferous forest habitats will increase on Tacoma lands from its current 309 acres to 4,319 acres over the life of the HCP and early successional stages of forest also favored by olive-sided flycatchers will remain a feature of the landscape on covered lands. Increases in these forest habitat types, especially mature and late-seral conditions, could potentially led to increases in the population of olive-sided flycatcher at the local level and have positive effects on the regional population.

Pacific Fisher

Pacific fisher historically occurred throughout much of the forested areas of Washington, though they were not thought to be particularly abundant. The Pacific fisher was over-trapped in the 19th and early 20th centuries. Trapping combined with predator and pest control, and loss and alteration of habitat pushed fisher close to extirpation in Washington. Despite protection from legal harvest for over 65 years, fisher have not recovered. Factors that have kept Pacific fisher from recovering include continued habitat loss and fragmentation, residual effects of harvest, past predator and pest control programs, low reproductive capacity of species, and genetic effects of small, isolated populations (WDFW 1998).

Minimization and Mitigation Measures

Minimization and mitigation measures for Pacific fisher include the protection and establishment of mature and late-seral coniferous forest conditions in the Natural and Conservation Zones as well as in UMAs and to a lesser extent riparian buffers. Coniferous forests in the Natural Zone, stands greater than 100 years old in the Conservation Zone, UMAs, and riparian buffers will be allowed to develop without intervention over the life of the permit, while the remaining lands in the Conservation Zone will be managed to accelerate the development of late-seral and mature coniferous forest conditions. Once these stands reach the age of 100 years, no additional timber-harvest activities will be allowed under the HCP. Large blocks of mature forested habitat that develop in the Natural and Conservation zones will provide areas of secure, undisturbed habitat suitable for Pacific fisher foraging and denning.

During the harvest of timber in the Commercial Zone and those portions of the Conservation Zone less than 100 years old, Tacoma has committed to retain all safe snags, a minimum of four green recruitment trees, and four logs per acre harvested. If at least six suitable snags as defined in HCM 3-01G in the HCP are not available per acre harvested, additional green recruitment trees will be retained at a ratio of 1 to 1. If less that two snags are available per acre, Tacoma will actively create 2 snags per acre from 2 of the larger green recruitment trees. This measure will be adaptively managed to ensure snags of adequate size for Pacific fisher will be part of the landscape on covered lands subject to harvest. All snags will be retained in the Natural Zone,

stands in the Conservation Zone 100 years old or older, UMA, and no-harvest riparian buffers, except danger trees within 150 feet of active roads.

Tacoma will also implement seasonal restrictions around Pacific fisher dens. Tacoma will not conduct timber felling, yarding, road construction, the use of helicopters for commercial timber harvest and silvicutural activities, or blast within 0.50 mile of any known Pacific fisher den from February 1 to July 31.

Primary Beneficial and Detrimental Effects

Habitat Effects

Pacific fisher use late-successional forests more frequently than early to mid-successional forests that result from timber harvest (Aubry and Houston 1992). Good Pacific fisher habitat has also been characterized as having a high degree of diversity consisting of multi-aged stands interspersed with small openings and containing wetlands and riparian habitats (Banci 1989). Riparian habitats are used extensively by Pacific fishers, especially as travel corridors and rest sites (Buck et al. 1983, Jones and Garton 1994, Seglund 1995). Pacific fishers rely heavily on snags and live trees with elevated cavities for natal den sites (Buck et al. 1995, Weir 1995, Aubry et al.1996) and favor hollow, large, downed logs or other lower structures for maternal den sites (WDFW 1998a).

Considerable acreage of mature and late-seral forests that would benefit Pacific fisher is expected to develop in the Natural and Conservation Zones and to a lesser extent in the UMAs and riparian buffers. Over the 50 year life of the HCP, the total amount of mature coniferous forest (106 to 155 years old) on Tacoma lands is anticipated to increase from 268 acres to 4,027 acres. In addition, the total amount of late-seral coniferous forests (>155 years old) is expected to increase from 41 acres to 292 acres. By permit expiration, 82 percent of the late-seral forest (238 of 292 acres) and 64 percent of the mature forest (2,593 of 4,027) will be in the Natural Zone. Five percent (15 acres) of late-seral forest and 29 percent (1,161cres) of mature forest will be in the Conservation Zone. The remaining 13 percent (39 acres) of late-seral and 7 percent (272 acres) of mature forest will be contained in UMAs and riparian buffers.

Both the UMAs and riparian buffers will not be subject to timber harvest during the life of the HCP. In addition, the HCP requires partial-harvest riparian buffers of 50 feet on Type 3 streams and 25 feet on Type 5 streams. These buffers are in addition to the no-harvest buffers required for these stream types. When conducting partial harvest on Type 3 stream buffers, Tacoma has agreed under the HCP to leave the largest 70 coniferous trees per acre. On Type 5 streams, Tacoma has committed to retaining the largest 50 coniferous trees per acre. All buffers widths will be measured horizontally on both sides of the stream from the ordinary high water mark, channel migration zone, or channel disturbance zone whichever is greater. By 2048 it is projected that all riparian areas will be 55 years of age or older, with 4 percent of these areas exceeding 155 years old. Riparian buffers cover 2,125 acres of the covered lands. Although UMAs constitute a small portion of Tacoma's ownership, theses areas are not subject to harvest and consequently could provide some additional habitat for Pacific fisher. There are currently 103 acres of UMAs in the Conservation Zone and 150 acres in the Commercial Zone.

Under the HCP, Tacoma will manage 3,858 acres of their lands for commercial timber harvest. Excluding riparian buffers and UMA, there are approximately 3,285 acres of the 3,858 acres available for commercial harvest. Forest stands eligible for harvest in the Commercial Zone contain habitat suitable for Pacific fisher. There are currently 703 acres of coniferous forest 76 to 105 years old and 97 acres of coniferous forest 106 to 155 years old in the Commercial Zone. Over the term of the HCP, stands in the 76 to 105 year old age class will decrease to 50 acres while stands in the 106 to 155 year old age class will increase to 268 acres with an addition 39 acres exceeding 155 year of age. This represents a net decrease of approximately 346 acres of suitable habitat in the Commercial Zone over the 50 year term of the HCP. Losses in habitat are expected to be off-set by the overall gain in forests of 106 years old or older from 309 acres to 4,319 acres.

Disturbance Effects

Primary activities that could result in disturbance and potentially led to the incidental take of Pacific fisher include uneven-aged harvest activities in stands in the Conservation Zone, even-aged harvest in the Commercial Zone, and road management and use including road abandonment and decommissioning.

In the Conservation Zone, stands less than 100 years of age will be subject to an uneven-aged harvest regime for the purposes of accelerating or enhancing the development of late-seral forest characteristics. It is anticipated that these disturbances will be short-term in nature and would not likely diminish the suitability of the stand's habitat for Pacific fisher. To further minimize the amount of disturbance that may result from harvest of stands in the Conservation Zone, seasonal timing restrictions described previously will be implemented at known den sites. Over the 50 year term of the HCP, areas in the Conservation Zone that are subject to uneven-aged harvest and those areas of the Conservation Zone 100 years old or older, are expected to develop late-seral forest conditions. No more than 2 percent (46 acres) of the coniferous stands in the Conservation Zone will be harvested in any year.

Under the HCP, Tacoma will manage 3,858 acres of their lands for commercial timber harvest. Excluding riparian buffers and UMA, there are approximately 3,285 acres of the 3,858 acres available for commercial harvest. To minimize the amount of disturbance that may result from the even-aged harvest of stands in the Commercial Zone, seasonal timing restrictions described previously will be implemented at known denning locations. Impacts due to timber harvest are expected to be infrequent since, on average, more than 1.5 percent (49 acres) of the coniferous stands in the Commercial Zone will be harvested in any year, corresponding to only 1 to 2 entries per year.

Road construction, management, and use implemented according to the HCP could, in some instances, result in disturbance to Pacific fisher. Tacoma will remove unnecessary roads and will cause no net increase of roads in the Natural Zone where habitat for Pacific fisher is most likely to currently exist and develop over the term of the HCP. In addition, Tacoma has also committed to maintaining locked gates to restrict public access to the upper watershed, thereby reducing potential negative effects associated with high densities of open road.

Injury/Death
The potential for direct injury or death of Pacific fisher is anticipated to be extremely low. Because the watershed is closed to the general public and seasonal restrictions will be implemented around active dens, the potential for direct mortality of Pacific fisher including that caused by trapping is considered to be very small.

Population-Level Effects
The FWS does not anticipate short-term reductions in the baseline of Pacific fisher to result from the HCP, because the likelihood of incidental take due to habitat modification and disturbance on Tacoma lands under the provisions of the HCP are expected to be rare. Pacific fisher are not currently known to inhabit covered lands or the larger Green River Watershed.

The HCP is expected to have a net positive effect on Pacific fisher and contribute to improvements in its status both locally and regionally by increasing habitat function and quantity on covered lands for Pacific fisher and prey species, and controlling access to the upper Green River Watershed. Late-seral and mature coniferous forest habitats will increase on Tacoma lands from its current 309 acres to 4,319 acres over the life of the HCP and approximately 6,957 acres of 11,644 forested acres on covered lands will be managed for mature and late-seral conditions and not be subject to commercial harvest over the term of the HCP.

Pacific Lamprey/River Lamprey

Both Pacific and river lamprey have been observed in the Green River below Tacoma's Headworks Dam. Pacific lamprey are considered to be common, while only two river lampreys were observed during juvenile salmon surveys of the Green River (R2 1999).

Minimization and Mitigation Measures
Tacoma has committed to maintaining minimum instream continuous flow in the Green River during summer periods as measured at the Auburn gage. Under Tacoma's First Diversion Water Right claim, Tacoma, during wet years, has committed under the HCP to maintain 350 cfs at the Auburn gage. During wet to average years, Tacoma will maintain 300 cfs during the summer period. During average to dry years, Tacoma will be required to maintain flows of 250 cfs and during drought years, Tacoma will maintain at least 225 cfs at the Auburn gage (see HCM 1-01 in the HCP). Before withdrawing water under their Second Diversion Water Right, Tacoma will also adhere to seasonal minimum instream flows at the Palmer and Auburn gages. Tacoma will not exercise the Second diversion Water Right if flows are less than 200 cfs from July 15 to September 15 and 300 cfs from September 16 to July 14 as measured at the Palmer gage. During the period of July 15 to September 15, Tacoma will also not exercise the Second Diversion Water Right when river flows are less than 400 cfs at the Auburn gage (see HCM 1-02 in the HCP).

Primary Beneficial and Detrimental Effects
Habitat Effects

If Pacific and river lamprey are present in the Green River below Tacoma's diversion facility (RM 61.0), their migration upstream to the Headworks will likely not be prevented by Tacoma's water withdrawals and the associated guaranteed minimum flows at the Auburn and Palmer gages committed to in HCM 1-01 and 1-02. Although the flows committed to were not established for Pacific and river lamprey specifically, they are anticipated to be adequate because these flows were considered sufficient for upstream passage of chinook salmon. Adult chinook salmon require greater water depths to move upstream over riffles than lampreys. Based on data collected at riffles in the lower river during the State's instream flow study, water depths in the Green River were determined to be sufficient for upstream passage of chinook when flows at the Auburn gage exceeded 225 cfs (Caldwell and Hirshey 1989). Guaranteed flows under HCM 1-01 will not fall below 225 cfs and during average and wet years minimum instream flows at the Auburn gage will be from 250 and 300 cfs, respectfully. Based on the ability of chinook salmon to navigate the Green River when flows at the Auburn gage exceed 225 cfs, it is appropriate to assume that these flows are also adequate for Pacific and river lamprey.

Disturbance Effects
Tacoma's water withdrawals will adversely affect several life stages of Pacific and river lamprey and, in some instances, may result in the death of individuals. Conservation measures committed to in the HCP are designed to minimize any adverse affects associated with water withdrawal activities and maintain instream flows of at least 225 cfs at the Auburn gage from July 15 to September 15 yearly over the term of the HCP.

Adult Pacific lamprey enter freshwater between April and June and complete their upstream migration by September (Beamish 1980). River lamprey return to freshwater between September and late winter (Beamish 1980). The adults of both species overwinter in deep pools and spawn the following spring. Flows present during the period when Pacific and river lamprey are entering freshwater and moving upstream to spawn are not expected to significantly hamper their ability to migrate. Although Pacific and river lamprey are relatively poor swimmers, their unique morphology (buccal funnel) allows them to ascend to the upper reaches of watersheds and negotiate areas impassible to chinook or coho. Instream flows during upstream migration periods for adult lampreys were based on the needs of chinook and coho to successfully migrate upstream during roughly the same time frame, and therefore, assumed sufficient for Pacific and river lampreys.

Young adult Pacific and river lamprey migrating downstream rely on currents to carry them to the ocean. Young adult Pacific lamprey migrate downstream from April to May and young adult river lamprey migrate downstream from May to July. Reductions in flows during these periods could result in delay of out-migration for both of these species, and in some instances mortality associated with stranding, trapping, and increase predation. Tacoma's water diversion is expected to exacerbate this condition and further effect the downstream migration of Pacific and

river lamprey. In addition to maintaining instream flows of at least 225 cfs as measured at the Auburn gage, Tacoma will also plan to two freshets during April and May to minimize the effects of water withdrawal. During normal years these freshets will measure 2,500 cfs for 38 hours at the Auburn gage, and during dry years they will measure 1,250 cfs for 38 hours.

Both species of lamprey overwinter and spawn in the spring between April and June with Pacific lamprey spawning earlier followed by river lamprey. Spawning habitats used by Pacific and river lamprey are similar to that preferred by salmon, and therefore, Tacoma water withdrawals may result in some reduction in Pacific and river lamprey spawning habitat in the lower and middle Green River. There is no specific information regarding Pacific and river lamprey spawning locations or timing for the lower and middle Green River. Since the incubation period for Pacific and river lamprey eggs (4 to 5 weeks at 59 degrees) is notably shorter than the incubation period for salmon eggs, the period of time which Pacific and river lamprey eggs would be vulnerable to the effects of dewatering would be less than the time salmon eggs would be vulnerable. Subsequently, measures designed to minimize the negative effects of water withdrawal on salmon spawning are likely to be adequate for Pacific and river lamprey.

Juvenile Pacific and river lamprey may be more susceptible to low flow conditions than the other life forms or stages discussed previously. Because larval lamprey may rear in fresh water for extended periods of time (up to seven years has been reported), they are more vulnerable to low flow conditions than salmonids. Rearing habitat in the form of side channels and back water areas in the middle Green River will be reduced by an average of 1.4 acres during May through July as compared to existing conditions without water withdrawals. Instream flow provisions based on the needs of salmon will also maintain important rearing habitats for juvenile Pacific and river lamprey during low flow and drought conditions. Tacoma will also restore and reconnect Signani Slough to mitigate for expected loses of side channel and backwaters under proposed water withdrawals.

Currently, Pacific and river lamprey do not exist above HHD and, although fish passage facilities will be designed to collect Pacific and river lamprey if desired, there are no immediate plans to collect and transport Pacific and river lamprey around HHD to be released into the upper watershed. Although both the Pacific and river lamprey are native to the Green River, the focus of the initial reintroduction efforts will be salmonids. Reintroduction of Pacific and river lamprey along with salmonids into a regulated system may have unforeseen impacts and, as such, a reintroduction will be preceded by a thorough evaluation of risks and benefits. Therefore, forest and watershed management activities in the upper watershed will not affect Pacific and river lamprey.

Injury/Death

Potential for direct injury or death of Pacific and river lamprey is anticipated to be low. Flows in the middle and lower Green River and habitat conditions in the middle Green River under the HCP are considered to be adequate. No take of Pacific and river lamprey is expected to result from the construction and operation of upstream and downstream fish passage facilities at Tacoma's Headworks, because there are no plans to collect and transport Pacific and river

lamprey above Tacoma's diversion.

Population-Level Effects
The FWS anticipates that there will be no reduction in the baseline of this species resulting from the implementation of the HCP. Incidental take of Pacific and river lamprey due to habitat modifications is expected to be small. Flows in the middle and lower Green River were established to be adequate for chinook and therefore, are expected to be adequate for Pacific and river lamprey.

Peregrine Falcon

Peregrine falcons were de-listed by the FWS, but remains listed as endangered by the State of Washington. Most documented nesting in Washington occurs along Puget Sound, in the San Juan Islands, and along the north coastline (Smith et al. 1997). Breeding sites are relatively rare in interior Washington, but eyries in the southern and central Cascades have been reported. Four individuals have been observed in the Green River basin, but no nests are known to occur (USFS 1996). Approximately 600 acres of suitable cliff habitat occurs in the upper watershed. Washington also provides migratory and wintering habitat for peregrine falcons breeding in Alaska and Canada.

Minimization and Mitigation Measures
Tacoma will not conduct timber felling, yarding, road construction, or use of helicopters for commercial timber harvest and silvicutural activities within 0.50 mile, or blast within 1.0 mile of any known active peregrine falcon nest from March 1 to July 31.

Tacoma will conduct no timber felling or habitat alteration within 100 feet of any known peregrine falcon nest site and all potential nest cliffs greater that 75 feet in height in the Green River Watershed. During timber harvest within 660 feet of a known peregrine nest site, Tacoma will retain all "super dominate" trees defined as trees, that are significantly larger and taller than the remaining stand.

Other minimization and mitigation measures for peregrine falcons include the establishment of mature and late-seral coniferous forest conditions in the Natural and Conservation Zones as well as in UMAs and riparian buffers. Coniferous forests in the Natural Zone, stands greater than 100 years old in the Conservation Zone, UMAs, and no-harvest riparian buffers will be allowed to develop without intervention over the life of the permit. The remaining lands in the Conservation Zone will be managed to accelerate the development of late-seral and mature coniferous forest conditions. Once these stands reach the age of 100 years, no additional timber-harvest activities will be allowed under the HCP.

Primary Beneficial and Detrimental Effects

Habitat Effects

All known nest sites and potential nesting cliffs on covered lands will be surrounded by a no-harvest buffer 100 feet wide. In addition, Tacoma will retain all large, dominant trees that are significantly larger and taller than the surrounding stand out 660 feet. These trees will provide perches around known nest sites.

Considerable acreage of mature and late-seral forests capable of providing habitat for peregrine falcon prey species is expected to develop in the Natural and Conservation Zones and to a lesser extent in the UMAs and riparian buffers. Over the 50 year life of the HCP, the total amount of mature coniferous forest (106 to 155 years old) on Tacoma lands is anticipated to increase from 268 acres to 4,027 acres. In addition, the total amount of late-seral coniferous forests (>155 years old) is expected to increase from 41 acres to 292 acres. By permit expiration, 82 percent of the late-seral forest (238 of 292 acres) and 64 percent of the mature forest (2,593 of 4,027) will be in the Natural Zone. Five percent (13 acres) of late-seral forest and 29 percent (1,161 acres) of mature forest will be in the Conservation Zone. The remaining 13 percent (39 acres) of late-seral and 7 percent (272 acres) of mature forest will be contained in UMAs and riparian buffers.

In the Conservation Zone, stands less than 100 years of age will be subject to an uneven-aged harvest regime for the purposes of accelerating or enhancing the development of late-seral forest characteristics. Such activities may result in temporary disturbance to peregrine falcons, but such actions will also result in open stands of mature and late-seral forest that will provide potential forage areas for peregrine falcons.

Under the HCP, Tacoma will manage 3,858 acres of their lands for commercial timber harvest. Forest stands eligible for harvest in the Commercial Zone could currently provide some habitat for peregrine falcon prey species. There are currently 705 acres of coniferous forest 76 to 105 years old and 97 acres of coniferous forest 106 to 155 years old in the Commercial Zone. Over the term of the HCP, stands in the 76 to 105 year old age.class will decrease to 60 acres while stands in the 106 to 155 year old age class will increase to 268 acres with an addition 39 acres exceeding 155 years of age. This represents a net decrease in 346 acres of mature forest habitat (76-105 years old) in the Commercial Zone. This represents a loss of potential habitatfor prey species. Buffers around known nests, suitable cliffs, and potential forage areas (lakes and larger wetlands), and the fact that Tacoma is able to control public access to much of the upper watershed, reduces the potential that, if present, peregrine falcons would be disturbed.

Lakes and wetlands at least 5 acres in size with a half acre or more of open water will be surround with 200-foot no-harvest riparian buffers. Lakes and large wetlands are potential foraging sites for peregrine falcons supporting adequate numbers waterfowl and are natural, open areas that suit the falcon's hunting strategy.

Disturbance Effects

Covered activities under the HCP that may disturb, harm, or otherwise take peregrine falcons include even-aged timber harvest in the Commercial Zone, uneven-aged harvest in the Conservation Zone, road management, use, and abandonment, and silvicultural activities such as planting, pruning, thinning, salvage harvesting, and hardwood conversion. Since the amount and rate of timber harvest occurs at low levels in both zones, disturbance associated with timber-harvest and related activities such as road construction is expected to be infrequent and temporary. On average, only 2 percent (46 acres) of the coniferous forests in the Conservation Zone and 1.5 percent of the Commercial Zone (49 acres) will be harvested per year. The amount of timber being harvested corresponds to 1 to 2 entries per year per zone. In addition, buffers around nests, potential nesting cliffs, or foraging area (lakes and natural, open areas) will minimize the amount of disturbance from timber harvest.

Injury/Death

Potential of direct injury or death of peregrine falcons is anticipated to be extremely low. Under the HCP, Tacoma has committed to the protection of known nest sites and potential nesting habitat as well as buffer potential forage areas (lakes and large wetlands) thereby reducing disturbance. Tacoma is also committed to maintaining locked gates to restrict public access to the upper watershed which will minimize the potential for falcon/human interactions and human-caused mortality.

Population-Level Effects

The FWS anticipates no reductions in the baseline of this species to result from the HCP and the potential for the incidental take of peregrine falcons on covered lands under the provisions of the HCP to be extremely small. Over the long-term, the HCP is expected to benefit peregrine falcons and contribute to improvements in its status both locally and regionally by increasing habitat for prey species, and protecting known nest sites and potential nesting areas (cliffs).

Pileated Woodpecker

Pileated woodpeckers inhabit large tracts of late-successional forests and requires large diameter snags and decadent live trees to nest, roost, and forage (Bull and Jackson 1995, Mellen et al. 1992). Pileated woodpeckers occur in the upper Green River Watershed, but habitat on at least half of the 148,000 acre watershed is considered marginal for pileated woodpeckers because less than 1 snag per acre currently exists (USFS 1996).

Minimization and Mitigation Measures

Minimization and mitigation measures for pileated woodpeckers include the protection and establishment of mature and late-seral coniferous forest conditions in the Natural and Conservation Zones as well as in UMAs and riparian buffers. Coniferous forests in the Natural Zone, stands greater than 100 years old in the Conservation Zone, UMAs, and no-harvest riparian buffers will be allowed to develop without intervention over the life of the permit, while the remaining lands in the Conservation Zone will be managed to accelerate the development of

mature and late-seral coniferous forest conditions. Once these stands reach the age of 100 years, no additional timber-harvest activities will be allowed under the HCP.

During the harvest of timber in the Commercial Zone, the portions of the Conservation Zone less than 100 years old, and partial-harvest riparian buffers, Tacoma has committed to retain all safe snags, a minimum of four green recruitment trees, and four logs per acre harvested. If at least six suitable snags as defined in HCM 3-01G are not available per acre harvested, additional green recruitment trees will be retained at a ratio of 1 to 1. If less that two snags are available per acre, Tacoma will actively create 2 snags per acre from the larger green recruitment trees expected to be at least 16 to 20 inches in diameter. This measure will be adaptively managed to ensure snags will be part of the landscape on covered lands subject to harvest. During harvest activities, Tacoma will give preference to leaving green recruitment trees with visible signs of pileated woodpecker use.

Primary Beneficial and Detrimental Effects

Habitat Effects

Considerable acreage of mature and late-seral forests capable of supporting pileated woodpecker nesting and foraging is expected to develop in the Natural and Conservation Zones and, to a lesser extent, in the UMAs and riparian buffers. Over the 50 year life of the HCP, the total amount of mature coniferous forest (106 to 155 years old) on Tacoma lands is anticipated to increase from 268 acres to 4,027 acres. In addition, the total amount of late-seral coniferous forests (>155 years old) is expected to increase from 41 acres to 292 acres. By permit expiration, 82 percent of the late-seral forest (238 of 292 acres) and 64 percent of the mature forest (2,593 of 4,027) will be in the Natural Zone. Five percent (13 acres) of late-seral forest and 29 percent (1,161 acres) of mature forest will be in the Conservation Zone. The remaining 13 percent (39 acres) of late-seral and 7 percent (272 acres) of mature forest will be contained in UMAs and riparian buffers.

With the increase of late-seral and mature forest from 309 acres to 4,319 acres, it is anticipated the number and size of snags will also increase. Because there will be no commercial harvest in the Natural Zone, stands in the Conservation Zone 100 years old or older, in UMAs, and in no-harvest riparian buffers, existing snags will continue to persist and new snags will develop over the life of the HCP. In the Commercial Zone, the portions of the Conservation Zone less than 100 years old, and partial-harvest riparian buffers, Tacoma has committed to retain all safe snags, a minimum of four green recruitment trees, and four logs per acre harvested. If at least six suitable snags as defined in HCM 3-01G are not available per acre harvested, additional green recruitment trees will be retained at a ratio of 1 to 1. If less that two snags are available per acre, Tacoma will actively create 2 snags per acre from green recruitment trees expected to be at least 16 to 20 inches in diameter. This measure will be adaptively managed to ensure snags will be part of the landscape on covered lands subject to harvest. During harvest activities Tacoma will give preference to leaving green recruitment trees with visible signs of pileated woodpecker use. These measures should result in an increase in the number and the size of snags available for foraging and nesting by pileated woodpeckers in all zones.

Under the HCP, Tacoma will manage 3,858 acres of their lands for commercial timber harvest. Forest stands eligible for harvest in the Commercial Zone could currently provide habitat for pileated woodpeckers. Harvest activities may result in the disturbance of pileated woodpeckers and pileated woodpecker habitat. There are currently 703 acres of coniferous forest 76 to 105 years old and 97 acres of coniferous forest 106 to 155 years old in the Commercial Zone. Over the term of the HCP, stands in the 76 to 105 year old age class will decrease to 50 acres while stands in the 106 to 155 year old age class will increase to 268 acres with an addition 39 acres exceeding 155 years of age. This represents a net decrease of 346 acres of mature forest habitat in the Commercial Zone over the 50 year term of the HCP. Losses in habitat are expected to be off-set by the overall gain on covered lands of forests 106 years old or older from 309 acres to 4,319 acres and the retention of all safe snags on covered lands.

Disturbance Effects

Covered activities under the HCP that may disturb, harm, or otherwise injure pileated woodpeckers include even-aged timber harvest in the Commercial Zone, uneven-aged harvest in the Conservation Zone, road management, use, and abandonment, and silvicultural activities such as planting, pruning, thinning, salvage harvesting, and hardwood conversion.

In the Conservation Zone, stands less than 100 years of age will be subject to an uneven-aged harvest regime for the purposes of accelerating or enhancing the development of late-seral forest characteristics. Such activities may result in temporary disturbance to pileated woodpeckers and a reduction in pileated woodpecker habitat, but these effects are expected to be short-lived. Over the 50 year term of the HCP, areas in the Conservation Zone that are subject to uneven-aged harvest are expected to develop late-seral forest with small openings and snags suitable for pileated woodpeckers for nesting and foraging.

Under the HCP, Tacoma will manage 3,858 acres of their lands for commercial timber harvest. Forest stands eligible for harvest in the Commercial Zone could currently provide habitat for pileated woodpeckers. Harvest activities may result in the disturbance of pileated woodpeckers and a reduction in pileated woodpecker habitat, and the potential removal of nesting cavities.

Since the amount and rate of timber harvest occurs at low levels in both zones, disturbance associated with timber-harvest and related activities such as road construction is expect to be infrequent and temporary. On average, only 2 percent (46 acres) of the coniferous forests in the Conservation Zone and 1.5 percent of the Commercial Zone (49 acres) will be harvested per year. The amount of timber being harvested corresponds to 1 to 2 entries per year per zone.

Injury/Death

Potential of direct injury or death of pileated woodpeckers is anticipated to be low. Under the HCP, Tacoma has committed to the long-term protection of existing pileated woodpecker habitat in the Natural Zone and increasing the amount of suitable pileated woodpecker habitat in the Natural Zone, Conservation Zone, UMAs, and riparian buffers over the term of the HCP. There is a potential that unknown nest sites could be accidentally disturbed or destroyed during timber

harvest in the Conservation and Commercial Zones, but Tacoma will minimize the likelihood of injury or death of pileated woodpeckers by retaining all safe snags and giving preference to leaving green recruitment trees with visible signs of pileated woodpecker activity.

Population-Level Effects
The FWS anticipates only short-term reductions in the baseline of this species to result from the HCP. The potential for the incidental take of pileated woodpeckers due to habitat modification and disturbance on Tacoma lands under the provisions of the HCP is anticipated to be small. Over the long-term, the HCP is expected to benefit pileated woodpeckers and contribute to improvements in its status both locally and regionally by increasing habitat function and quantity. Late-seral and mature coniferous forest habitats will increase on Tacoma lands from its current 309 acres to 4,319 acres over the life of the HCP. Increase in these forest habitat types could potentially led to increases in the population of pileated woodpeckers at the local level and have positive effects on the regional population.

Tailed Frog

Tailed frogs are found from sea level to approximately 5000 feet. They are usually associated with fast moving streams that are well shaded. The tailed frog is the only frog species that has internal fertilization. Hatchlings and tadpoles grasp boulders with suction bands. They metamorphose in two to five years and reach sexual maturity a few years later (Corkran and Thoms 1996).

Mitigation and Minimization Measures
Tacoma will retain no-harvest riparian buffers along all streams and wetlands within covered lands. No-harvest buffer widths will vary according to stream and wetland types. No-harvest riparian buffers on WDNR Stream Types 1 and 2 will be 200 feet wide. No-harvest buffers on Type 3 streams will be 150 feet wide. No-harvest buffers on Type 4 streams will be 50 feet wide and will expand out to 100 feet at key locations. These locations are at the origin of Type 4 streams, at headwalls and along steeps and unstable slopes, at confluences with other Type 4 streams, at the confluences of Type 4 streams with fish-bearing streams, around springs and seeps, and along low gradient reaches. No-harvest riparian buffers on Type 5 streams will be 25 feet wide. In addition, the HCP requires partial-harvest riparian buffers of 50 feet on Type 3 streams and 25 feet on Type 5 streams. These buffers are in addition to and landward of the no-harvest buffers required for these stream types. When conducting partial harvest on Type 3 stream buffers, Tacoma has agreed under the HCP to leave the largest 70 coniferous trees per acre. On Type 5 streams, Tacoma has committed to retaining the largest 50 coniferous trees per acre. All buffer widths will be measured horizontally on both sides of the stream from the ordinary high water mark, channel migration zone, or channel disturbance zone whichever is greater.

To reduce impacts of sediment from road construction and maintenance Tacoma will: 1) participate in Watershed Analysis, 2) participate in the development and implementation of a

Road Sediment Reduction Plan, 3) implement mass wasting prescriptions from Watershed Analysis for all new road construction, 4) use full bench construction with no side-casting of material on all side slopes greater than 60 percent, 5) mulch and seed all road cuts, 6) maintain locked gates to restrict road access, 7) abandon all roads that are no longer needed for watershed management, forestry, or HCP implementation, and 8) discontinue heavy truck traffic when there is a potential for excessive road damage or water quality impacts.

Habitat Effects

Riparian buffers of adequate width provide shade, stabilize stream banks, contribute small and large woody debris and fine organic mater to maintain instream habitat features, maintain water quality, and improve forest connectivity between streams. Adult tailed frogs are known to forage into the uplands at night, and both adult and larval tailed frogs are adapted to very cold water. All stream segments on covered lands will receive continuous no-harvest buffers. The total area encompassed by no-harvest riparian buffers in the Natural, Conservation, and Commercial Zones will be 2,125 acres plus an additional 189 acres of partial-harvest riparian buffers. The effective buffer width in the Natural Zone will be greater because the entire zone is no-harvest.

Perennial and seasonal non-fish streams where tailed frogs are typically at higher densities (Type 4 and 5 under the HCP and Type N under forest practices rules) receive more protective buffers under Tacoma's HCP than similar waters would receive under current state forest practices rules. Type 4 streams or perennial Type N streams receive 50 to 100-foot no-harvest buffers under Tacoma's HCP. Under current forest practices the same streams would receive a 50-foot buffer over approximately 50 percent of their lengths. Type 5 streams or Type N seasonal streams under Tacoma's HCP receive 25-foot no-harvest and 25-foot partial-harvest buffers. Partial harvest on covered lands consists of retaining the 50 largest coniferous trees per acre of buffer. The effective buffer width in the Natural Zone will be greater because the entire zone is no-harvest. Similar streams under state forest practices rules may not be buffered at all unless steep and unstable slopes are present. Prior to the adoption of new state forest practices rules, small non-fish bearing streams received no protection in the upper Green River Watershed.

The age of riparian buffers along streams is also as important. Mature forest cover is considered more beneficial since it contributes to the cool, moist microclimates required by adult tailed frogs that can forage into the uplands at night. Currently, riparian stands on Tacoma lands range from as young as 6 years old to stand ages exceeding 156 years old, with roughly 50 percent of the stands being 55 years old or less. By 2048 it is projected that all riparian areas will be 55 years of age or older, with 4 percent of these areas exceeding 156 years old.

Welsh and Ollivier (1992) found the density of the three stream amphibian species studied was lower in streams affected by sediment due to road construction than in control streams. Two of three species had significantly lower numbers in all five stream micro habitats evaluated. Macro-invertebrates, the primary food source of juvenile fish and some amphibians, also typically decline when large amounts of sediment are added to the stream system (Furniss et al. 1991). Negative impacts to tailed frogs could occur if riparian buffer widths are insufficient to prevent

deleterious increases in sediment loads and stream temperatures after timber-harvest activities. On covered lands the potential for this is believed to be low because of adequate buffer widths and the relatively low rates of harvest under the terms of the HCP. On average, only 1.5 percent (49 acres) of the Commercial Zone and 2 percent (46 acres) of the Conservation Zone will be harvested in any year during the HCP term, and no harvest unit in the Commercial and Conservation zones will exceed 40 acres and 120 acres, respectively.

Under the HCP, Tacoma will also implement measures to reduce the amount of sediment being delivered to wetlands and riparian habitats. Tacoma will contribute funds and participate in the development of a Road Sediment Reduction Plan describing the priorities and schedule for road maintenance, improvement, and abandonment activities that will be implemented to reduce road sediment inputs to less than 50 percent of the estimated background sediment production rates as determined by Watershed Analysis. Within two years of the permit issuance, Tacoma will prepare and prioritize plans to abandon unnecessary existing roads and within five years Tacoma will complete the abandonment of the roads identified. Tacoma will implement prescriptions developed by Watershed Analysis specific to the construction of new temporary and permanent roads. When constructing roads on side slopes greater than 60 percent, Tacoma will use full bench construction with no side-casting of excavated material. Tacoma will place mulch and grass seed on all road cuts with slopes greater that 40 percent near water crossings, as well as in all locations where there is the possibility of severe erosion or slumping above the road. Where Tacoma has control over road use, they will maintain locked gates to restrict road use by the general public and will also discontinue heavy truck traffic under its control when there is a potential for extraordinary damage to the road or excessive impacts to water quality. These measures combined with riparian buffers are anticipated to reduce sediment delivery to non-fish and fish-bearing stream.

Primary Beneficial and Detrimental Effects

Disturbance Effect

Under the HCP, Tacoma will be required to replace culverts where fish passages has been artificially blocked by their road construction and maintenance activities. This activity is scheduled to happen during the first seven years of the Permit coverage. Removing and replacing culverts in order to restore fish passage to streams previously blocked by undersized culverts could have an adverse impact on tailed frogs that currently reside in these stream segments. Tailed frogs will likely continue to persist in these stream segments, but at lower densities. Although these fish restoration actions will have an adverse affect on some individuals of tailed frogs, all potential tailed frog habitat on covered lands will be buffered and measures to significantly reduce the amount of sediment entering this habitat will be implemented.

The introduction of aquatic predatory species could adversely affect the numbers and distribution of tailed frogs. Similar introductions are, at least, partially to blame for the precipitous decline of other amphibian species (McAllister and Leonard 1997, Leonard et al. 1993). To minimize the likelihood that aquatic predators become established or, if present, expand their range in the upper Green River Watershed, Tacoma has committed to maintaining locked gates to restrict

road use by the general public, thus reducing the probability for accidental or intentional introduction of aquatic predators.

Other covered activities that could result in the disturbance to or injury of tailed frogs include: timber-harvest and hauling activities; road construction, maintenance, decommissioning and use; road culvert removal, replacement, and maintenance; and silvicultural activities such as planting and thinning. The amount of disturbance to tailed frogs is expected to be minimal, because covered activities are expected to occur a low levels based on the amount of timber harvest Tacoma engages yearly, and riparian protection measures are designed to minimize disturbance to habitat.

Injury/Death

Potential for direct injury or death of tailed frogs is anticipated to be extremely low. Controlled access to the watershed, the reduction of sediment, and the buffering of all fish and non-fishbearing stream segments on covered lands are anticipated to minimize the potential for the direct take of tailed frogs.

Population-Level Effects

The FWS anticipates only a short-term reductions in the baseline of this species to result from the HCP. The replacement of culverts to correct a man-made fish blockages will result in the decline of some local populations. The HCP is expected to have a net positive effect on tailed frogs and contribute to improvements in its status both locally and regionally by protecting existing habitat, controlling sediment sources, and limiting the potential for the introduction of aquatic predators by controlling access to the upper Green River Watershed.

Van Dyke's Salamander

The Van Dyke's salamander has been found along rocky streams, wet talus, splash zones of water falls, and under rocks, logs, and forest litter from sea level up to 3,600 feet (Leonard et al 1993). It is also thought to be associated with riparian habitats in mature and old growth coniferous forests. Downed, rotted logs seem to be a key feature associated with the habitats described for Van Dyke's salamander (WDFW 1991). According to Olsen et al. (1999), the Van Dyke's salamander can be considered somewhat of a generalist, because it can be found in a variety of habitats and a large range of elevations. These habitat associations include lotic habitats, forested habitats of all soil and substrates and seral stages, montane lake shores, cave entrances, rocky substrates, and water fall splash zones.

Mitigation and Minimization Measures

Tacoma's management of the Natural and Conservation Zones are designed to promote the development of mature and late-seral forest conditions on covered lands. Lands in the Natural Zone and those stands in the Conservation Zone 100 years old or older will be allowed to develop without intervention during the 50 year term of the HCP. Salvage harvest will not be conducted in these zones, and therefore, the number of downed rotted logs is expected to increase

over time. Although other lands in the Conservation Zone will be subject to an uneven-aged harvest regime, the purpose of this practice is to accelerate and enhance the development of mature and late-seral forest conditions. As well as retaining no-harvest riparian buffers on all streams on cover lands, Tacoma will expand buffers to include headwalls and seeps. On covered lands subject to harvest activities, at least four downed logs will be retained per acre harvested. Measures developed to protect Larch Mountain salamanders will also benefit the Van Dyke's salamander.

Tacoma will retain no-harvest riparian buffers along all streams and wetlands within covered lands. No-harvest buffer widths will vary according to stream and wetland types. No-harvest riparian buffers on WDNR Stream Types 1 and 2 will be 200 feet wide. No-harvest buffers on Type 3 streams will be 150 feet wide. No-harvest buffers on Type 4 streams will be 50 feet wide and will expand out to 100 feet at key locations. These locations are at the origin of Type 4 streams, at headwalls and along steeps and unstable slopes, at confluences with other Type 4 streams, at the confluences of Type 4 streams with fish-bearing streams, around springs and seeps, and along low gradient reaches. No-harvest riparian buffers on Type 5 streams will be 25 feet wide. In addition, the HCP requires partial-harvest riparian buffers of 50 feet on Type 3 streams and 25 feet on Type 5 streams. These buffers are in addition to and landward of the no-harvest buffers required for these stream types. When conducting partial harvest on Type 3 stream buffers, Tacoma has agreed under the HCP to leave the largest 70 coniferous trees per acre. On Type 5 streams, Tacoma has committed to retaining the largest 50 coniferous trees per acre. All buffer widths will be measured horizontally on both sides of the stream from the ordinary high water mark, channel migration zone, or channel disturbance zone whichever is greater.

Wetland buffers will also vary in width according to the size and type of wetland encountered (See table 5.3 of the HCP). Non-forested wetlands with at least 0.5 acre of open water will receive 100 to 200-foot no-harvest buffers. Non-forested wetlands with less than 0.5 acre of open water with receive 50 to100-foot no-harvest buffers. Forest wetlands described as greater than 30 percent canopy coverage will receive no-harvest buffers varying in width from 25 to 50 feet. All buffers will be measured horizontally from the edge of the wetland.

To reduce impacts of sediment from road construction and maintenance Tacoma will: 1) participate in Watershed Analysis, 2) participate in the development and implementation of a Road Sediment Reduction Plan, 3) implement mass wasting prescriptions from Watershed Analysis for all new road construction, 4) use full bench construction with no side-casting of material on all side slopes greater than 60 percent, 5) mulch and seed all road cuts, 6) maintain locked gates to restrict road access, 7) abandon all roads that are no longer needed for watershed management, forestry, or HCP implementation, 8) discontinue heavy truck traffic when there is a potential for excessive road damage or water quality impacts.

Primary Beneficial and Detrimental Effects

Habitat Effects

As the result of the HCP, considerable acreage of mature and late-seral forests preferred by Van Dyke's salamanders is expected to develop in the Natural and Conservation Zones and to a lesser extent in the UMAs and riparian buffers. Over the 50 year life of the HCP, the total amount of mature coniferous forest (106 to 155 years old) on Tacoma lands is anticipated to increase from 268 acres to 4,027 acres. In addition, the total amount of late-seral coniferous forests (>155 years old) is expected to increase from 41 acres to 292 acres. By permit expiration, 77 percent of the late-seral forest (196 of 253 acres) and 57 percent of the mature forest (2,105 of 3,718) will be in the Natural Zone. Eight percent (19 acres) of late-seral forest and 36 percent (1,326 acres) of mature forest will be in the Conservation Zone. The remaining 15 percent (38 acres) of late-seral and 7 percent (26 acres) of mature forest will be contained in UMAs and riparian buffers.

The total area encompassed by no-harvest riparian buffers in the Natural, Conservation, and Commercial Zones will be 2,125 acres plus an additional 189 acres of partial-harvest riparian buffers. The age of riparian buffers along streams influences the microclimate of the stream providing cool, moist conditions considered to be an important component of Van Dyke's salamander habitat Olson et al. 1999). Currently, riparian stands on Tacoma lands range from as young as 6 years old to stand ages exceeding 156 years old, with roughly 50 percent of the stands being 55 years old or less. By 2048, it is projected that all riparian areas will be 55 years of age or older, with 4 percent of these areas exceeding 156 years old creating mature forest conditions along all riparian segments on covered lands.

In addition, all non-forested wetlands 0.25 acre or greater and all forested wetlands 0.50 acre or greater, will receive no-harvest buffers ranging from 25 feet to 200 feet in width depending on the type and size of the wetland. Although the amount of wetland riparian acres is not determinable at this time, it is in addition to the 2,125 acres of riparian acres buffering streams and will develop mature forest conditions over the term of the permit similar to forest conditions in stream buffers.

Under the HCP, Tacoma will also implement measures to reduce the amount of sediment being delivered to wetlands and riparian habitats. Tacoma will contribute funds and participate in the development of a Road Sediment Reduction Plan describing the priorities and schedule for road maintenance, improvement, and abandonment activities that will be implemented to reduce road sediment inputs to less than 50 percent of the estimated background sediment production rates as determined by Watershed Analysis. Within two years of the Permit issuance, Tacoma will prepare and prioritize plans to abandon unnecessary existing roads and within five years Tacoma will complete the abandonment of the roads identified. Tacoma will implement prescriptions developed by Watershed Analysis specific to the construction of new temporary and permanent roads. When constructing roads on side slopes greater than 60 percent, Tacoma will use full bench construction with no side-casting of excavated material. Tacoma will place mulch and grass seed on all road cuts with slopes greater that 40 percent near water crossings, as well as in all locations where there is the possibility of severe erosion or slumping above the road. Where

Tacoma has control over road use, they will maintain locked gates to restrict road use by the general public and will also discontinue heavy truck traffic under its control when there is a potential for extraordinary damage to the road or excessive impacts to water quality. In addition, Tacoma will not construct roads across Type A and B wetlands. These measures combined with riparian and wetland buffers are anticipated to reduce sediment delivery to non-fish and fish-bearing stream, wetlands, and the reservoir.

Where Van Dyke's salamander habitat exists on covered lands, normal operations related to timber management and harvest could adversely impact the amount and quality of such habitat. Because of operational considerations and constraints, non-forested wetlands less than 0.25 acre in size will not be buffered. The amount of small non-forested wetlands on covered lands subject to harvest is undeterminable at this time, but it is not anticipated to be significant. To minimize this impact, all non-forested wetlands including wetlands less than 0.25 acre that are located in the Natural Zone, stands in the Conservation Zone 100 years old or older, UMAs, or within no-harvest riparian buffers will not be subject to harvest under the terms of the HCP. Only non-forested wetland less than 0.25 acre in the Commercial Zone and parts of the Conservation Zone eligible for harvest will be adversely impacted by harvest-related activities. These small wetlands could provide habitat for Van Dyke's salamander and this habitat could be adversely impacted by covered activities. Similar impacts to small, forested wetlands (< 0.5 acre) are anticipated under the HCP, since Tacoma will only buffer forested wetlands that are 0.5 acre in size or greater. Downed logs will remain a natural feature of the landscape in the Natural and Conservation Zones. Where harvest is permitted, at least four downed logs will be retained.

Disturbance Effect

Under the HCP, Tacoma will be required to replace culverts where fish passages has been artificially blocked by their road construction and maintenance activities. This activity is scheduled to happen during the first seven years of the Permit coverage. Removing and replacing culverts in order to restore fish passage to streams previously blocked by undersized culverts could have an adverse impact on Van Dyke's salamanders that currently reside in these stream segments. Van Dyke's salamanders will likely continue to persist in these stream segment, but at lower densities. Although these fish restoration actions will have an adverse affect on some individuals of Van Dyke's salamanders, all potential Van Dyke's salamanders habitat on covered lands will be buffered and measures to significantly reduce the amount of sediment entering this habitat will be implemented.

The introduction of aquatic predatory species could adversely affect the numbers and distribution of Van Dyke's salamanders. Similar introductions are, at least, partially to blame for the precipitous decline of other amphibian species (McAllister and Leonard 1997, Leonard et al. 1993). To minimize the likelihood that aquatic predators become established or, if present, expand their range in the upper Green River Watershed, Tacoma has committed to maintaining locked gates to restrict road use by the general public.

Other covered activities that could result in the disturbance to or injury of Van Dyke's salamanders include: timber-harvest and hauling activities; road construction, maintenance, decommissioning and use; road culvert removal, replacement, and maintenance; and silvicultural activities such as planting and thinning. The amount of disturbance to Van Dyke's salamanders is expected to be minimal, because covered activities are expected to occur a low levels based on the amount of timber harvest Tacoma engages yearly and riparian protection measures are designed to minimize disturbance to habitat.

Injury/Death

Potential for direct injury or death of Van Dyke's salamanders is anticipated to be extremely low. Controlled access to the watershed, the reduction of sediment, and the buffering of all fish and non-fishbearing stream segments on covered lands are anticipated to minimize the potential for the direct take of Van Dyke's salamanders.

Population-Level Effects

The FWS anticipates only a short-term reductions in the baseline of this species to result from the HCP, because the replacement of culverts to correct a man-made fish passage problem will result in the decline in some local populations. The HCP is expected to have a net positive effect on Van Dyke's salamanders and contribute to improvements in its status both locally and regionally by protecting existing habitat, controlling sediment sources, and limiting the potential for the introduction of aquatic predators by controlling access to the upper Green River Watershed.

Vaux's Swift

Vaux's swifts nest in mature and old growth coniferous forests and require cavities in large hollow snags or broken tops of live green trees for nesting and roosting. West of the Cascades, nest snags are thought to need to be at least 40 feet tall and 35 inches in diameter. Vaux's swift have been documented in the Green River Watershed, but roosting or nesting is not known to occur on covered lands.

Mitigation and Minimization Measures

Minimization and mitigation measures for Vaux's swifts include the protection and establishment of mature and late-seral coniferous forest conditions in the Natural and Conservation Zones as well as in UMAs and to a lesser extent riparian buffers. Coniferous forests in the Natural Zone, stands greater than 100 years old in the Conservation Zone, UMAs, and riparian buffers will be allowed to develop without intervention over the life of the permit, while the remaining lands in the Conservation Zone will be managed to accelerate the development of mature and late-seral coniferous forest conditions. Once these stands reach the age of 100 years, no additional timber-harvest activities will be allowed under the HCP.

During the harvest of timber in the Commercial Zone and those portions of the Conservation Zone less than 100 years old, Tacoma has committed to retain all safe snags and minimum of four green recruitment trees. If at least six suitable snags as defined in HCM 3-01G are not

available per acre harvested, additional green recruitment trees will be retained at a ratio of 1 to 1. If less than two snags are available per acre, Tacoma will actively create 2 snags per acre from the larger green recruitment trees expected to be at least 16 to 20 inches in diameter. This measure will be adaptively managed to ensure snags will be part of the landscape on covered lands subject to harvest. All snags will be retained in the Natural Zone, stands in the Conservation Zone 100 years old or older, UMA, and no-harvest riparian buffers, except danger trees within 150 feet of active roads. During harvest activities Tacoma will give preference to leaving green recruitment trees with visible signs of Vaux's swift nesting or roosting and those with potential for future use. Tacoma will also attempt to leave other green recruitment trees clumped around trees with signs of Vaux's swift use to protect these trees from windthrow and changes in microclimate.

Primary Beneficial and Detrimental Effects

Habitat Effects

Considerable acreage of mature and late-seral forests capable of harboring Vaux's swift is expected to develop in the Natural and Conservation Zones and to a lesser extent in the UMAs and riparian buffers. Over the 50 year life of the HCP, the total amount of mature coniferous forest (106 to 155 years old) on Tacoma lands is anticipated to increase from 268 acres to 4,027 acres. In addition, the total amount of late-seral coniferous forests (>155 years old) is expected to increase from 41 acres to 292 acres. By permit expiration, 82 percent of the late-seral forest (238 of 292 acres) and 64 percent of the mature forest (2,593 of 4,027) will be in the Natural Zone. Five percent (15 acres) of late-seral forest and 29 percent (1,161 acres) of mature forest will be in the Conservation Zone. The remaining 13 percent (39 acres) of late-seral and 7 percent (272 acres) of mature forest will be contained in UMAs and riparian buffers.

With the increase of late-seral and mature forest from 309 acres to 4,319 it is anticipated the number and size of snags will also increase. Because there will be no commercial harvest in the Natural Zone, stands in the Conservation Zone 100 years old or older, in UMAs, and in no-harvest riparian buffers, existing snags will continue to persist and new snags will develop over the life of the HCP. In the Commercial Zone, the portions of the Conservation Zone less than 100 years old, and partial-harvest riparian buffers, Tacoma has committed to retain all safe snags, a minimum of four green recruitment trees, and four logs per acre harvested. If at least six suitable snags as defined in HCM 3-01G are not available per acre harvested, additional green recruitment trees will be retained at a ratio of 1 to 1. If less than two snags are available per acre, Tacoma will actively create 2 snags per acre from green recruitment trees. This measure will be adaptively managed to ensure snags will be part of the landscape on covered lands subject to harvest. During harvest activities Tacoma will give preference to leaving green recruitment trees with visible signs of Vaux's swift nesting or roosting and those with potential for future use. Overtime, these measures should result in an increase in the number and the size of snags available for roosting and nesting by Vaux's swift in all zones.

Under the HCP, Tacoma will manage 3,858 acres of their lands for commercial timber harvest. Forest stands eligible for harvest in the Commercial Zone could currently provide habitat for

Vaux's swift. Harvest activities may result in the disturbance of Vaux's swift and Vaux's swift habitat. There are currently 703 acres of coniferous forest 76 to 105 years old and 97 acres of coniferous forest 106 to 155 years old in the Commercial Zone. Over the term of the HCP, stands in the 76 to 105 year old age class will decrease to 50 acres while stands in the 106 to 155 year old age class will increase to 268 acres with an addition 39 acres exceeding 155 years of age. This represents a net decrease of 346 acres of mature forest habitat in the Commercial Zone over the 50 year term of the HCP. Losses in habitat are expected to be off-set by the overall gain on covered lands of forests 106 years old or older from 309 acres to 4,319 acres and the retention of all safe snags on covered lands.

Disturbance Effects

Covered activities under the HCP that may disturb, harm, or otherwise injure Vaux's swift include even-aged timber harvest in the Commercial Zone, uneven-aged harvest in the Conservation Zone, road management, use, and abandonment, and silvicultural activities such as planting, pruning, thinning, salvage harvesting, and hardwood conversion.

In the Conservation Zone, stands less than 100 years of age will be subject to an uneven-aged harvest regime for the purposes of accelerating or enhancing the development of late-seral forest characteristics. Such activities may result in temporary disturbance to Vaux's swift and a reduction in Vaux's swift habitat, but these effects are expected to be short-lived. Over the 50 year term of the HCP, areas in the Conservation Zone that are subject to uneven-aged harvest are expected to develop late-seral forest with small openings and snags suitable for Vaux's swift for nesting and foraging.

Under the HCP, Tacoma will manage 3,858 acres of their lands for commercial timber harvest. Forest stands eligible for harvest in the Commercial Zone could currently provide habitat for Vaux's swift. Harvest activities may result in the disturbance of Vaux's swift and a reduction in Vaux's swift habitat, and could potentially result in the removal of large cavities capable of supporting nesting and roosting swifts. To prevent this from occurring, Tacoma will search for trees with visible signs of Vaux's swift use and protect them unless deemed a safety risk.

Since the amount and rate of timber harvest occurs at low levels in both zones, disturbance associated with timber-harvest and related activities such as road construction is expect to be infrequent and temporary. On average, only 2 percent (46 acres) of the coniferous forests in the Conservation Zone and 1.5 percent of the Commercial Zone (49 acres) will be harvested per year. The amount of timber being harvested corresponds to approximately 1 to 2 entries per year per zone.

Injury/Death

Potential of direct injury or death of Vaux's swift is anticipated to be low. Under the HCP, Tacoma has committed to long-term protection of existing Vaux's swift habitat in the Natural Zone and increasing the amount of suitable Vaux's swift habitat in the Natural Zone, Conservation Zone, UMAs, and riparian buffers over the term of the HCP. There is a potential

that unknown nesting and roosting sites could be accidentally disturbed or destroyed during timber harvest in the Conservation and Commercial Zones, but Tacoma will minimize the likelihood of injury or death of Vaux's swift by retaining all safe snags and giving preference to leaving green recruitment trees with visible signs of Vaux's swift nesting and roosting.

Population-Level Effects

The FWS anticipates only short-term reductions in the baseline of this species to result from the HCP and the potential for the incidental take of Vaux's swift due to habitat modification and disturbance on Tacoma lands under the provisions of the HCP to be small. Over the long-term, the HCP is expected to benefit Vaux's swift and contribute to improvements in its status both locally and regionally by increasing habitat function and quantity. Late-seral and mature coniferous forest habitats will increase on Tacoma lands from its current 309 acres to 4,319 acres over the life of the HCP. Increases in these forest habitat types could potentially led to increases in the population of Vaux's swift at the local level and have positive effects on the regional population.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future state, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. Several of the more important federal actions include on-going consultation with the COE on the operation and maintenance of HHD and Reservoir, implementation of the Northwest Forest Plan on USFS lands in the region, on-going implementation of the Plum Creek Timber Company HCP in the Snoqualmie Pass area and the WDNR HCP, the land exchange between Plum Creek Timber Company and the USFS in the Central Cascades, and the implementation of the recently completed City of Seattle's HCP in the Cedar River Watershed. Future federal actions include completion of the Tri-County HCP in Snohomish, King and Pierce Counties. Finally, the FWS anticipates consultation on changes to the Washington State Forest Practices Rules and Regulations, which are currently being revised to comport with the substance of the Forests and Fish Agreement (WDNR, April 1999).

The Green River Watershed represents, to some degree, a gap in contiguous federal ownership in the Cascade Range. Only 21 percent of the watershed is currently under federal ownership (USFS) and this small percentage is not expected to change significantly over time. Private timber companies own the largest portion of land in the watershed (> 50%) followed by USFS, WDNR, and Tacoma.

Actions not expected to be subject to separate consultation pursuant to section 7 of the Act include the following:

1. On-going commercial forest management: The FWS anticipates that existing non-federal forest lands in the action area will continue to be cut as they reach harvestable diameters and stocking levels. Existing roads will be maintained to access the forest stands, and some new roads will be constructed to access the timber. The harvest of timber on non-federal in the upper Green River Watershed will be conducted under the rules and regulations of the state's forest practices rules.

2. Residential and commercial development is expected to continue to occur at a rapid rate, resulting in loss of fish and wildlife habitat and individual animals. This loss is expected to continue adjacent to the upper Green River Watershed, as it has already occurred along the entire lower Green River and significant areas along the middle Green River. The effects of development, especially for candidate, threatened, and endangered species, are also expected to increase as the size of the developed area increases. For the purpose of this opinion and cumulative effects analysis, the projected future expanse of the developed area will be assumed to be the extent on non-federal lands in the lower, middle, and upper Green River Watershed not covered by this or another HCP.

Under the restricted access set forth in the HCP, cumulative effects such as poaching loss, increased fishing pressure, and other effects resulting from access by humans will be decrease

under the conservation measures contained in the HCP and addressed in this opinion, but continue to occur on non-federal lands elsewhere.

CONCLUSION

Listed Species/Critical Habitat

Gray Wolf

After reviewing the current status of the gray wolf, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the FWS's biological opinion that the City of Tacoma's HCP, as proposed, is not likely to jeopardize the continued existence of this species. The Effects of the Action section above fully describes the Service's rationale for arriving at this conclusion. No critical habitat has been designated for gray wolf, therefore none will be affected. Below is a summary of the components of the proposed HCP that were particularly instrumental in supporting the FWS's conclusion with regard to gray wolf:

1. The protection of mature, late-seral, and old growth forests in the Natural and Conservation Zones resulting in an increase of these habitat types from the current 309 acres to 4,027 acres over the term of the Permit;

2. The establishment of continuous, no-harvest riparian buffers on all streams bordering covered lands providing key foraging and calving areas for prey species;

3. Commitments to abandon all unnecessary roads and allow no net increase of permanent roads in 5,850 acre Natural Zone;

4. Prohibit the general public from entering the watershed and prohibit firearms in the vehicles of contractors working for Tacoma. Consumptive and non-consumptive recreation will be prohibited within the watershed except by tribal members or as approved by the WDFW;

5. The implementation of seasonal protection measures around known gray wolf den sites and first rendezvous sites. These seasonal restrictions will prevent timber felling, road construction, blasting, and aircraft activity from occurring within 1.0 mile of a den site and 0.25 mile of a first rendezvous site.

Bald Eagle

After reviewing the current status of the bald eagle, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the FWS's biological opinion that the City of Tacoma's HCP, as proposed, is not likely to jeopardize the continued existence of this species. The Effects of the Action section above fully describes the FWS's rationale for arriving at this conclusion. No critical habitat has been designated for bald eagle, therefore none will be affected. Below is a summary of the components of the proposed HCP that were particularly instrumental in supporting the FWS's conclusion with regard to bald eagle:

1. The protection of mature, late-seral, and old growth forests in the Natural and Conservation Zones resulting in an increase of suitable nesting and roosting habitat from the current 309 acres to 4,027 acres over the term of the Permit;

2. The establishment of continuous, no-harvest riparian buffers on all streams, lakes and wetlands bordering covered lands providing potential foraging and nesting habitat for bald eagles;

3. The re-establishment of anadromous fish to the upper 45 percent of the Green River, restoring an historic food base (spawning adult salmon and salmon carcasses) for bald eagles interrupted by the construction of the Tacoma Headwords Dam in 1913;

4. Prohibit the general public from entering the watershed and prohibit firearms in the vehicles of contractors working for Tacoma. Consumptive and non-consumptive recreation will be prohibited within the watershed except by tribal members or as approved by the WDFW;

5. The implementation of seasonal protection measures around all known bald eagles nests and communal roosting sites. These seasonal restrictions will prevent timber felling, road construction from occurring within 0.25 mile and blasting and aircraft activity from occurring within 1.0 mile of a nest or communal night roost site. In addition, Tacoma will conduct no timber felling or other habitat alteration within 400 feet of a bald eagle nest or communal roost site.

Bull Trout/Dolly Varden

After reviewing the current status of the bull trout, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the FWS's biological opinion that the City of Tacoma's HCP, as proposed, is not likely to jeopardize the continued existence of this species. The Effects of the Action section above fully describes the FWS's rationale for arriving at this conclusion. No critical habitat has been designated for bull trout, therefore none will be affected. Below is a summary of the components of the proposed HCP that were particularly instrumental in supporting the FWS's conclusion with regard to bull trout:

1. The establishment of continuous, no-harvest riparian buffers on all fish bearing and non-fish bearing streams within and boarding covered lands. Buffers are of adequate width to maintain habitat characteristics (i.e. large woody debris, shade, bank stability etc.) associated with properly functioning bull trout habitat;

2. Restoration of upstream and downstream fish passage for all native anadromous fish including bull trout;

3. Commitment to an Instream Flow Agreement that has higher minimum flows than occur currently and results in more useable habitat for all anadromous salmonids than would occur under present flow conditions or under aquatic natural, unregulated flow conditions;

4. The placement of large woody debris, small woody debris, and suitable spawning gravels in the middle Green River to improve instream habitat conditions;

5. The implementation of aquatic habitat restoration projects above and below Tacoma Headworks Dam;

6. The implementation of measures to reduce sediment delivery to streams from timber harvest and road construction, maintenance, and use.

Canada Lynx

After reviewing the current status of the Canada lynx, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the FWS's biological opinion that the City of Tacoma's HCP, as proposed, is not likely to jeopardize the continued existence of this species. The Effects of the Action section above fully describes the FWS's rationale for arriving at this conclusion. No critical habitat has been designated for Canada lynx, therefore none will be affected. Below is a summary of the components of the proposed HCP that were particularly instrumental in supporting the FWS's conclusion with regard to Canada lynx:

1. The protection of mature, late-seral, and old growth forests in the Natural and Conservation Zones resulting in an increase the of amount secure, undisturbed area for travel and potential denning by Canada lynx from the current 309 acres to 4,027 acres over the term of the Permit;

2. Prohibit the general public from entering the watershed and prohibit firearms in the vehicles of contractors working for Tacoma. Consumptive and non-consumptive recreation will be prohibited within the watershed except by tribal members or as approved by the WDFW;

3. The implementation of seasonal protection measures around all Canada lynx dens and potential denning habitat. These seasonal restrictions will prevent timber felling, road construction, blasting and aircraft activity from occurring within 0.5 mile of Canada lynx den or potential denning habitat.

Grizzly Bear

After reviewing the current status of the grizzly bear, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the FWS's biological

opinion that the City of Tacoma's HCP, as proposed, is not likely to jeopardize the continued existence of this species. The Effects of the Action section above fully describes the FWS's rationale for arriving at this conclusion. No critical habitat has been designated for grizzly bear, therefore none will be affected. Below is a summary of the components of the proposed HCP that were particularly instrumental in supporting the FWS's conclusion with regard to grizzly bear:

1. The protection of mature, late-seral, and old growth forests in the Natural and Conservation Zones resulting in an increase of the amount of secure, undisturbed habitat from the current 309 acres to 4,027 acres over the term of the Permit;

2. Prohibit the general public from entering the watershed and prohibit firearms in the vehicles of contractors working for Tacoma. Consumptive and non-consumptive recreation will be prohibited within the watershed except by tribal members or as approved by the WDFW;

3. The implementation of seasonal protection measures around all grizzly bear dens. These seasonal restrictions will prevent timber felling, road construction, blasting and aircraft activity from occurring within 1.0 mile of a grizzly bear den.

4. The re-establishment of anadromous fish to the upper 45 percent of the Green River, restoring an historic food base (spawning adult salmon and salmon carcasses) for grizzly bears interrupted by the construction of the Tacoma Headwords Dam in 1913;

5. Suspension of all forest management and road construction activities within one mile of a confirmed sighting of a grizzly bear for 21 days to reduce bear-human interactions;

6. Prevent road construction across non-forested blueberry and black huckleberry fields, meadows, avalanche chutes, and WDNR type A and B wetlands;

7. Take measure to prevent the dumping of putrescent trash that could attract grizzly bears by restricting access to the watershed, prohibiting employees or contractors from dumping trash, and cleaning-up any newly discovered trash disposal sites.

Marbled Murrelet

After reviewing the current status of the marbled murrelet, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the FWS's biological opinion that the City of Tacoma's HCP, as proposed, is not likely to jeopardize the continued existence of this species. The Effects of the Action section above fully describes the FWS's rationale for arriving at this conclusion. No critical habitat has been designated for marbled murrelet on lands covered by the HCP, therefore none will be affected. Below is a summary of the components of the proposed HCP that were particularly instrumental in supporting the FWS's conclusion with regard to marbled murrelet:

1. The protection of mature, late-seral, and old growth forests in the Natural and Conservation Zones resulting in an increase of suitable nesting habitat from the current 309 acres to 4,027 acres over the term of the Permit;

2. Prohibit the general public from entering the watershed to reduce disturbance to nesting marbled murrelets;

3. The implementation of seasonal protection measures around all stands known to be occupied by marbled murrelet. These seasonal restrictions will prevent timber felling, road construction, and aircraft activity from occurring within 0.50 mile and blasting from occurring within 1.0 mile of an occupied stand, a stand where presence has been reported but occupancy not yet confirmed, and potential nesting habitat that has not been surveyed to protocol.

Northern Spotted Owl

After reviewing the current status of the northern spotted owl, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects; it is the FWS's biological opinion that the City of Tacoma's HCP, as proposed, is not likely to jeopardize the continued existence of this species. The Effects of the Action section above fully describes the FWS's rationale for arriving at this conclusion. No critical habitat has been designated for northern spotted owl on lands covered by the HCP, therefore none will be affected. Below is a summary of the components of the proposed HCP that were particularly instrumental in supporting the FWS's conclusion with regard to northern spotted owl:

1. The protection of mature, late-seral, and old growth forests in the Natural and Conservation Zones resulting in an increase of suitable nesting habitat from the current 309 acres to 4,027 acres over the term of the Permit;

2. The retention, during timber harvest, of all safe snags, minimum of four and up to ten green recruitment trees per acre, and four downed logs per acre. If less than 2 snags are available per acre, two snags per acre will be created at the time of timber harvest;

3. Prohibit the general public from entering the watershed to reduce disturbance to nesting northern spotted owls;

4. The implementation of seasonal protection measures around all stands known to be occupied by northern spotted owls. These seasonal restrictions will prevent timber felling, road construction, and aircraft activity from occurring within 0.25 mile and blasting from occurring within 1.0 mile of an active northern spotted owl nest.

Other Covered Species – Not Listed as Threatened or Endangered

Oregon Spotted Frog (candidate species)

After reviewing the current status of the Oregon spotted frog, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the FWS's biological opinion that the City of Tacoma's HCP, as proposed, is not likely to jeopardize the continued existence of this species. The Effects of the Action section above fully describes the FWS's rationale for arriving at this conclusion. Below is a summary of the components of the proposed HCP that were particularly instrumental in supporting the FWS's conclusion with regard to Oregon spotted frog:

1. The establishment of continuous, no-harvest riparian buffers on all streams and wetlands on covered lands;

2. Prohibit the general public from entering the watershed to reduce the risk of accidental or intentional introduction of aquatic predators such as the bull frog;

3. The implementation of measures to reduce sediment delivery to streams from timber harvest and road construction, maintenance, and use.

California Wolverine

After reviewing the current status of the California wolverine, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the FWS's biological opinion that the City of Tacoma's HCP, as proposed, is not likely to jeopardize the continued existence of this species. The Effects of the Action section above fully describes the FWS's rationale for arriving at this conclusion. Below is a summary of the components of the proposed HCP that were particularly instrumental in supporting the FWS's conclusion with regard to California wolverine:

1. The protection of mature, late-seral, and old growth forests in the Natural and Conservation Zones resulting in an increase of these habitat types from the current 309 acres to 4,027 acres over the term of the Permit;

2. The establishment of continuous, no-harvest riparian buffers on all streams within and bordering covered lands providing key foraging for wolverines;

3. Commitments to abandon all unnecessary roads and allow no net increase of permanent roads in the 5,850-acre Natural Zone;

4. Prohibit the general public from entering the watershed and prohibit firearms in the vehicles of contractors working for Tacoma. Consumptive and non-consumptive recreation will be prohibited within the watershed except by tribal members or as approved by the WDFW;

5. The implementation of seasonal protection measures around all known California wolverine dens. These seasonal restrictions will prevent timber felling, road construction, blasting, and aircraft activity from occurring within 0.50 mile of a California wolverine den.

Cascades Frog

After reviewing the current status of the Cascades frog, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the FWS's biological opinion that the City of Tacoma's HCP, as proposed, is not likely to jeopardize the continued existence of this species. The Effects of the Action section above fully describes the FWS's rationale for arriving at this conclusion. Below is a summary of the components of the proposed HCP that were particularly instrumental in supporting the FWS's conclusion with regard to Cascades frog:

1. The establishment of continuous, no-harvest riparian buffers on all streams and wetlands on covered lands;

2. Prohibit the general public from entering the watershed to reduce the risk of accidental or intentional introduction of aquatic predators such as the bull frog;

3. The implementation of measures to reduce sediment delivery to streams and wetlands from timber harvest and road construction, maintenance, and use.

Cascade Torrent Salamander

After reviewing the current status of the Cascade torrent salamander, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the FWS's biological opinion that the City of Tacoma's HCP, as proposed, is not likely to jeopardize the continued existence of this species. The Effects of the Action section above fully describes the FWS's rationale for arriving at this conclusion. Below is a summary of the components of the proposed HCP that were particularly instrumental in supporting the FWS's conclusion with regard to Cascade torrent salamander:

1. The establishment of continuous, no-harvest riparian buffers on all streams and wetlands on covered lands;

2. Prohibit the general public from entering the watershed to reduce the risk of accidental or intentional of aquatic predators such as the bull frog;

3. The implementation of measures to reduce sediment delivery to streams and wetlands from timber harvest and road construction, maintenance and use.

Coastal Cutthroat Trout

After reviewing the current status of the coastal cutthroat trout, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the FWS's biological opinion that the City of Tacoma's HCP, as proposed, is not likely to jeopardize the continued existence of this species. The Effects of the Action section above fully describes the FWS's rationale for arriving at this conclusion. Below is a summary of the components of the proposed HCP that were particularly instrumental in supporting the FWS's conclusion with regard to coastal cutthroat trout:

1. The establishment of continuous, no-harvest riparian buffers on all fish bearing and non-fish bearing streams within and boarding covered lands. Buffers are of adequate width to maintain habitat characteristics (i.e. large woody debris, shade, bank stability, etc.) associated with properly functioning coastal cutthroat trout habitat;

2. Restoration of upstream and downstream fish passage for all native anadromous fish including coastal cutthroat trout;

3. Commitment to an Instream Flow Agreement that has higher minimum flows than occur currently and results in more useable habitat for all anadromous salmonids than would occur under present flow conditions or under aquatic natural, unregulated flow conditions;

4. The placement of large woody debris, small woody debris, and suitable spawning gravels in the middle Green River to improve instream habitat conditions;

5. The implementation of aquatic habitat restoration projects above and below Tacoma Headworks Dam;

6. The implementation of measures to reduce sediment delivery to streams from timber harvest and road construction, maintenance, and use.

Common Loon

After reviewing the current status of the common loon, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the FWS's biological opinion that the City of Tacoma's HCP, as proposed, is not likely to jeopardize the continued existence of this species. The Effects of the Action section above fully describes the FWS's rationale for arriving at this conclusion. Below is a summary of the components of the proposed HCP that were particularly instrumental in supporting the FWS's conclusion with regard to common loon:

1. Implement a minimum of 200-foot buffer on all lakes and wetlands capable of supporting nesting and foraging common loons;

2. Prohibit the general public from entering the watershed, reducing disturbance to nesting and foraging common loons;

3. The re-establishment of anadromous fish to the upper 45 percent of the Green River, creating a food base (juvenile salmon) for common loons;

4. Reduction of fine sediments entering water bodies as a result of maintaining no-harvest buffers on all streams, lakes, and the reservoir and implementing measures to reduce erosion from existing and proposed roads.

Dolly Varden (proposed species by similarity of appearance)

After reviewing the current status of the Dolly Varden, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the FWS's biological opinion that the City of Tacoma's HCP, as proposed, is not likely to jeopardize the continued existence of this species. The Effects of the Action section above fully describes the FWS's rationale for arriving at this conclusion. Below is a summary of the components of the proposed HCP that were particularly instrumental in supporting the FWS's conclusion with regard to Dolly Varden:

1. The establishment of continuous, no-harvest riparian buffers on all fish bearing and non-fish bearing streams within and boarding covered lands. Buffers are of adequate width to maintain habitat characteristics (i.e. large woody debris, shade, bank stability, etc.) associated with properly functioning Dolly Varden habitat;

2. Restoration of upstream and downstream fish passage for all native anadromous fish including Dolly Varden;

3. Commitment to an Instream Flow Agreement that has higher minimum flows than occur currently and results in more useable habitat for all anadromous salmonids than would occur under present flow conditions or under aquatic natural, unregulated flow conditions;

4. The placement of large woody debris, small woody debris, and suitable spawning gravels in the middle Green River to improve instream habitat conditions;

5. The implementation of aquatic habitat restoration projects above and below Tacoma Headworks Dam;

6. The implementation of measures to reduce sediment delivery to streams from timber harvest and road construction, maintenance, and use.

Larch Mountain Salamander

After reviewing the current status of the Larch Mountain salamander, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the FWS's biological opinion that the City of Tacoma's HCP, as proposed, is not likely to jeopardize the continued existence of this species. The Effects of the Action section above fully describes the FWs's rationale for arriving at this conclusion. Below is a summary of the components of the proposed HCP that were particularly instrumental in supporting the FWS's conclusion with regard to Larch Mountain salamander:

1. The establishment of continuous, no-harvest riparian buffers on all streams and wetlands on covered lands;

2. The protection of mature, late-seral, and old growth forests in the Natural and Conservation Zones resulting in an increase of these habitat types from the current 309 acres to 4,027 acres over the term of the Permit;

3. Implement measures to survey for and protect habitat occupied by Larch Mountain salamanders;

4. The implementation of measures to reduce sediment delivery to streams and wetlands from timber harvest and road construction, maintenance and use.

Northern Goshawk

After reviewing the current status of the northern goshawk, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects it is the FWS's biological opinion that the City of Tacoma's HCP, as proposed, is not likely to jeopardize the continued existence of this species. The Effects of the Action section above fully describes the FWS's rationale for arriving at this conclusion. Below is a summary of the components of the proposed HCP that were particularly instrumental in supporting the FWS's conclusion with regard to northern goshawk:

1. The protection of mature, late-seral, and old growth forests in the Natural and Conservation Zones resulting in an increase of suitable northern goshawk nesting habitat from the current 309 acres to 4,027 acres over the term of the Permit;

2. The retention, during timber harvest, of all safe snags, minimum of four and up to ten green recruitment trees per acres, and four downed logs per acre. If less than 2 snags are available per acre, two snags per acre will be created at the time of timber harvest;

3. Prohibit the general public from entering the watershed to reduce disturbance to nesting northern goshawk;

4. The implementation of seasonal protection measures around all known northern goshawk nest sites. These seasonal restrictions will prevent timber felling and road construction from occurring within 0.25 mile, aircraft activity from occurring within 0.50 mile and blasting from occurring within 1.0 mile of an active northern goshawk nest.

Northwestern Pond Turtle

After reviewing the current status of the northwestern pond turtle, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the FWS's biological opinion that the City of Tacoma's HCP, as proposed, is not likely to jeopardize the continued existence of this species. The Effects of the Action section above fully describes the FWS's rationale for arriving at this conclusion. Below is a summary of the components of the proposed HCP that were particularly instrumental in supporting the FWS's conclusion with regard to northwestern pond turtle:

1. The establishment of continuous, no-harvest riparian buffers on all streams and wetlands on covered lands;

2. Prohibit the general public from entering the watershed to reduce the risk of accidental or intentional introduction of aquatic predators such as the bull frog;

3. The implementation of measures to reduce sediment delivery to streams and wetlands from timber harvest and road construction, maintenance, and use;

4. The implementation of site-specific plans developed by Tacoma and FWS to address the management needs of northwestern pond turtles should northwestern pond turtles be found on covered lands.

Olive-sided Flycatcher

After reviewing the current status of the olive-sided flycatcher, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the FWS's biological opinion that the City of Tacoma's HCP, as proposed, is not likely to jeopardize the continued existence of this species. The Effects of the Action section above fully describes the FWS's rationale for arriving at this conclusion. Below is a summary of the components of the proposed HCP that were particularly instrumental in supporting the FWS's conclusion with regard to olive-sided flycatcher:

1. Protection and establishment of mature and late-seral coniferous forest conditions in the Natural and Conservation Zones, UMAs, and riparian buffers;

2. The retention, during timber harvest, of all safe snags and a minimum of four and up to ten green recruitment trees per acres. If less than 2 snags are available per acre, two snags per acre will be created at the time of timber harvest.

Pacific Fisher

After reviewing the current status of the Pacific fisher, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the FWS's biological opinion that the City of Tacoma's HCP, as proposed, is not likely to jeopardize the continued existence of this species. The Effects of the Action section above fully describes the FWS's rationale for arriving at this conclusion. Below is a summary of the components of the proposed HCP that were particularly instrumental in supporting the FWS's conclusion with regard to Pacific fisher:

1. The protection of mature, late-seral, and old growth forests in the Natural and Conservation Zones resulting in an increase of these habitat types from the current 309 acres to 4,027 acres over the term of the Permit;

2. The establishment of continuous, no-harvest riparian buffers on all streams within and bordering covered lands providing key foraging areas for Pacific fisher;

3. Commitments to abandon all unnecessary roads and allow no net increase of permanent roads in the 5,850-acre Natural Zone;

4. Prohibit the general public from entering the watershed and prohibit firearms in the vehicles of contractors working for Tacoma. Consumptive and non-consumptive recreation will be prohibited within the watershed except by tribal members or as approved by the WDFW;

5. The implementation of seasonal protection measures around all known Pacific fisher den sites. These seasonal restrictions will prevent timber felling, road construction, blasting, and aircraft activity from occurring within 0.50 mile of a den site.

Pacific Lamprey

After reviewing the current status of the Pacific lamprey, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the FWS's biological opinion that the City of Tacoma's HCP, as proposed, is not likely to jeopardize the continued existence of this species. The Effects of the Action section above fully describes the FWS's rationale for arriving at this conclusion. Below is a summary of the components of the proposed HCP that were particularly instrumental in supporting the FWS's conclusion with regard to Pacific lamprey:

1. Commitment to an Instream Flow Agreement that has higher minimum flows than occur currently, and results in more useable habitat for all anadromous salmonids and Pacific lamprey than would occur under present flow conditions or under aquatic natural, unregulated flow conditions;

2. The placement of large woody debris, small woody debris, and suitable spawning gravels in the middle Green River to improve instream habitat conditions.

Pileated Woodpecker

After reviewing the current status of the pileated woodpecker, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the FWS's biological opinion that the City of Tacoma's HCP, as proposed, is not likely to jeopardize the continued existence of this species. The Effects of the Action section above fully describes the FWS's rationale for arriving at this conclusion. Below is a summary of the components of the proposed HCP that were particularly instrumental in supporting the FWS's conclusion with regard to pileated woodpecker:

1. Protection and establishment of mature and late-seral coniferous forest conditions in the Natural and Conservation Zones, UMAs, and riparian buffers;

2. The retention, during timber harvest, of all safe snags, minimum of four and up to ten green recruitment trees per acre and four down logs per acre. If less than 2 snags are available per acre, two snags per acre will be created at the time of timber harvest. Green trees with visible signs of pileated woodpecker nesting, roosting, or foraging will be given preference for protection during harvest.

Peregrine Falcon

After reviewing the current status of the peregrine falcon, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the FWS's biological opinion that the City of Tacoma's HCP, as proposed, is not likely to jeopardize the continued existence of this species. The Effects of the Action section above fully describes the FWS's rationale for arriving at this conclusion. Below is a summary of the components of the proposed HCP that were particularly instrumental in supporting the FWS's conclusion with regard to peregrine falcon:

1. Protection and establishment of mature and late-seral coniferous forest conditions in the Natural and Conservation Zones, UMAs, and riparian buffers;

2. The implementation of seasonal protection measures around all known peregrine falcon nests. These seasonal restrictions will prevent timber felling, road construction, blasting, and aircraft activity from occurring within 0.50 mile of a nest;

3. Prohibit the general public from entering the watershed to reduce disturbance to nesting peregrine falcons;

4. Protection of all habitat within 100 feet of a nest site or potential nesting cliffs and retention of "super dominant" trees within 660 feet of a nest to maintain perching sites for adult peregrine falcons.

River Lamprey

After reviewing the current status of the river lamprey, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the FWS's biological opinion that the City of Tacoma's HCP, as proposed, is not likely to jeopardize the continued existence of this species. The Effects of the Action section above fully describes the FWS's rationale for arriving at this conclusion. Below is a summary of the components of the proposed HCP that were particularly instrumental in supporting the FWS's conclusion with regard to river lamprey:

1. Commitment to an Instream Flow Agreement that has higher minimum flows than occur currently, and results in more useable habitat for all anadromous salmonids and river lamprey than would occur under present flow conditions or under aquatic natural, unregulated flow conditions;

2. The placement of large woody debris, small woody debris, and suitable spawning gravels in the middle Green River to improve instream habitat conditions.

Tailed Frog

After reviewing the current status of the tailed frog, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the FWS's biological opinion that the City of Tacoma's HCP, as proposed, is not likely to jeopardize the continued existence of this species. The Effects of the Action section above fully describes the FWS's rationale for arriving at this conclusion. Below is a summary of the components of the proposed HCP that were particularly instrumental in supporting the FWS's conclusion with regard to tailed frog:

1. The establishment of continuous, no-harvest riparian buffers on all streams and wetlands on covered lands;

2. Prohibit the general public from entering the watershed to reduce the risk of accidental or intentional introduction of aquatic predators such as the bull frog;

3. The implementation of measures to reduce sediment delivery to streams and wetlands from timber harvest and road construction, maintenance, and use.

VanDyke's Salamander

After reviewing the current status of the VanDyke's salamander, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the FWS's biological opinion that the City of Tacoma's HCP, as proposed, is not likely to jeopardize the continued existence of this species. The Effects of the Action section above fully describes the FWS's rationale for arriving at this conclusion. Below is a summary of the components of the proposed HCP that were particularly instrumental in supporting the FWS's conclusion with regard to VanDyke's salamander:

1. Protection and establishment of mature and late-seral coniferous forest conditions in the Natural and Conservation Zones, UMAs, and riparian buffers;

2. The implementation of measures to reduce sediment delivery to streams and wetlands from timber harvest and road construction, maintenance, and use;

3. The establishment of continuous, no-harvest riparian buffers on all streams and wetlands on covered lands.

Vaux's Swift

After reviewing the current status of the Vaux's swift, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the FWS's biological opinion that the City of Tacoma's HCP, as proposed, is not likely to jeopardize the continued existence of this species. The Effects of the Action section above fully describes the FWS's rationale for arriving at this conclusion. Below is a summary of the components of the proposed HCP that were particularly instrumental in supporting the FWS's conclusion with regard to Vaux's swift:

1. Protection and establishment of mature and late-seral coniferous forest conditions in the Natural and Conservation Zones, UMAs, and riparian buffers;

2. The retention, during timber harvest, of all safe snags and a minimum of four and up to ten green recruitment trees per acre. If less than 2 snags are available per acre, two snags per acre will be created at the time of timber harvest. Green trees with visible signs of Vaux's swift nesting or roosting will be given preference for protection during harvest.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act, and federal regulations issued pursuant to section 4(d) of the Act, prohibits take of endangered and threatened species, respectively, without a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. Harm is further defined by FWS to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the FWS as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be a prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

Note that 19 of the 26 species addressed in this BO are not currently listed or proposed (seven are listed species). Therefore, no take prohibition is in place for these 19 species at the time of this writing. The incidental take statements below, (and the section 10(a)(1)(B) Permit as it pertains to these species), do not become effective until (if and when) the currently unlisted species are listed under the Act. To the extent these incidental take statements conclude that take of any migratory bird species listed as threatened or endangered under the Act will result from the FWS's issuance of the Permit, FWS will not refer the incidental take of such migratory bird or eagle for prosecution under Migratory Bird Treaty Act of 1918, as amended (16 USC sections 703-712) or the Bald and Golden Eagle protection Act of 1940, as amended (16 USC sections 668-668-d), if such take is in compliance with the terms and conditions (including amount and/or number) specified herein.

FWS anticipates that the proposed action has the potential to result in the incidental take of Permit Species, as detailed below. We anticipate incidental take of individuals of the Permit Species would be typically difficult to detect for the following reasons: 1) low likelihood of finding an individual injury or death (and relating it to the action), given the relatively low density, secretive nature/concealing habitat (such as fossorial or log dwelling species), small size, and/or sporadic distribution of most proposed Permit Species; 2) the large area involved in the proposed activities; 3) the delayed effects of many of the activities that could take proposed Permit Species; 4) the rapid rate of decomposition of some of the proposed Permit Species (particularly fish) after death; 5) the high probability of scavenging of dead individuals by scavengers/predators. In the Incidental Take Statement below, we have used anticipated pre- and post-project activity on habitat conditions as a functional surrogate indicator of take where appropriate.

Take Not Covered

It is our policy (per Region 1 memorandum of July 27, 1998) to not consider for inclusion, pesticide and herbicide applications as a covered activity under section 10(a)(1)(B) Permits. The exceptions are those HCPs that address this topic and were submitted to us before July 27, 1998. The subject HCP was submitted to us after 1998. No take is anticipated herein as a result of pesticide or herbicide use in the Plan Area as a result of the proposed action. Pesticide or herbicide use is not a proposed covered activity. No take is authorized for pesticide or herbicide use under the proposed Permit.

Easements and rights-of-way occur within Tacoma's subject lands, with associated maintenance activities generally performed by parties other than Tacoma. Incidental take resulting from these activities is not covered herein, except for activities undertaken by Tacoma or their agents as specified in the Description of the Action (such as ungulate forage improvement activities). Examples of activities not covered herein include: construction or maintenance of powerlines or railroads (such as rip-rap stream slope protection for a railroad), associated right-of-way/easement vegetation maintenance (such as clearing of riparian vegetation along a powerline right-of-way), or right-of-way access construction or maintenance. Any take resulting from these activities would be subject to the prohibitions of section 9 of the Act and would need to be excepted or permitted separately through the section 7 or section 10 processes.

No take is herein anticipated or authorized for effects from the continued existence, operation, and/or maintenance of HHD including fluctuations of water levels in the HHD reservoir. No take is herein anticipated or authorized for un-specified pipeline construction, or service-area effects of water supply, associated with proposed water diversions. No take is herein anticipated for forestry and watershed management actions occurring outside 14,888 acres owned by Tacoma in the upper Green River Watershed. Water withdrawal actions under terms and conditions of the HCP are covered from, and downstream of Tacoma's Headworks facility located at RM 61.0.

Amount or Extent of Take

Listed and Proposed Species

Gray Wolf

We anticipate that an undetermined number of gray wolves (wolves) would be taken over a 50-year period as a result of this proposed action. The number of wolves taken is limited to those that might occur within or immediately adjacent to the 14,888 acres of covered lands and occur close enough to ongoing covered activities to be affected. The number of wolves anticipated to be taken is low, because of the very low number of wolves within the region at this time (due to the regional wolf population currently being well below carrying capacity due to past control efforts), as well as the low-moderate number of wolves expected to become established in the covered lands during the proposed Permit term, and due to the level of protection provided by the

proposed HCP. Significant avoidance and minimization measures for wolves are part of the prescriptions of the proposed HCP.

The incidental take over 50 years is anticipated to be in the following forms:

Harm - We anticipate incidental take of wolves in the form of harm, within the covered lands as a result of human activities associated with even-aged logging of 3,285 acres, uneven-aged logging of approximately 2,000 acres, and the construction, maintenance, and abandonment actions associated with 113 miles of Tacoma owned roads that cause adverse effects to wolf prey levels, reduce the function of denning habitat, or otherwise degrade wolf habitat. The FWS does not anticipate significant changes in the number or miles of roads on covered lands over the Permit term. FWS anticipates harm to wolves in occupied habitat as a result of the proposed action to be small due to restrictions on activities, restricted access to the watershed, and low numbers of wolves and wolf denning expected in the covered lands during the Permit term.

Harassment - We anticipate harassment to occur, due to disturbance of wolves from specified human activities, such as vehicle use and logging activities. The extent of harassment is anticipated to be low due to the small to moderate amount of human activities in the areas most likely occupied by wolves during the Permit period, combined with the small number of wolves expected within the covered lands during this period. Specifically, we are authorizing take of wolves due to disturbance within the covered lands, associated with even-aged logging of 3,285 acres, uneven-aged logging of approximately 2,000 acres, and the construction, maintenance, and abandonment actions associated with 113 miles of Tacoma owned roads that will occur over the 50-year term of the HCP. The FWS does not anticipate significant changes in the number or miles of roads on covered lands over the Permit term. Harassment of denning wolves as a result of implementation of covered activities should be minimal due to specified seasonal restrictions.

Direct Injury or Death - A very small number of wolves, if any, are anticipated to be injured or killed by vehicle use during the Permit term, when use is as specified in the Description of the Action. Wolves are often struck by vehicles wherever their range contains roads. Current roads in Tacoma's ownership total approximately 113 miles, and this mileage is not expected to significantly change with road abandonments and new road construction. Seasonal timing restrictions of activities, road closures, access restrictions, and long-term habitat protection measures around dens and first rendezvous sites will likely result in a very small level of take.

Bald Eagle

We anticipate that an undetermined number of bald eagles (eagles) would be taken over a 50-year period as a result of this proposed action. Take is herein anticipated for the proposed actions occurring within the 14,888 acres owned by Tacoma in the upper Green River Watershed. Nesting activity for eagles is currently known in covered lands. Most eagle nesting will likely occur in the 5,850 acre Natural Zone of the covered lands, which encompasses lower elevation lands directly adjacent to the Green River, major tributaries, and around the impoundment behind HHD. This zone extends upland from water bodies for a minimum of 200 feet. Most nesting

would likely occur within old growth remnants found within 1,000 acres of mid-successional forests in the Natural Zone or adjacent to shore along these protected water bodies. Non-nesting eagles would likely also be found roosting and foraging in this same area. As specified in the Description of the Action, most activities are restricted to areas outside the Natural Zone. Foraging, nesting, and roosting by eagles in the covered lands outside of the Natural Zone, are mainly expected along streams and in old growth remnants; both of these areas are protected from most human activity by restrictions on logging associated activities in riparian buffers and in forest stands greater that 105 years old.

Because of the small to moderate number of eagles expected in the covered lands during the Permit period, access to the whole covered lands is relatively restricted, logging activities in the Natural Zone are precluded, and because of seasonal timing and eagle nest site restrictions specified in the Description of the Action, take associated with nesting eagles should be very small. The number of eagles, if any, anticipated to be taken is small.

The incidental take over 50 years is anticipated to be in the following forms:

Harm - It is expected that the proposed Covered Activities would on rare occasions substantially degrade habitat suitability of eagles. Any eagle roosts (except known communal winter night roosts), foraging areas, or unknown eagle nests, outside of forest stands greater than 105 years old in the Conservation Zone (these <100 year old stands will range from 1900-2700 acres during the permit term), UMA, or specified riparian/wetland buffers, could be significantly degraded by proposed Covered Activities. Bald eagles that are associated with the even-aged logging of 3,285 acres, uneven-aged logging of approximately 2,000 acres, and the construction, maintenance, and abandonment actions associated with 113 miles of Tacoma owned roads will be taken. Most eagle habitat use in the covered lands is expected in higher habitat function areas, which are separate from where most proposed Covered Activities would occur, thus take in the form of harm would be rare. Additionally, under proposed long-term habitat protection measures, Tacoma has committed to conduct no timber felling or other habitat alterations within 400 feet of any known eagle nest or communal winter night roost. Because these roosts and nest are relatively easy to identify, this protection will likely encompass most nest and communal night roosts.

Harassment - Harassment, in the form of disturbance of an undetermined number of roosting or nesting eagles, is anticipated to occur. Harassment of nesting/communal winter roosting eagles is anticipated over the term of the proposed Permit, but only from: timber felling, yarding, road construction, or other habitat alterations outside of 0.25 mile (or within 0.50 mile along the direct line of sight) from any known eagle nest, or blasting outside of 1.0 mile of any known eagle nest. Within these zones, these specified activities are restricted for eagle nesting from January 1 through August 31, and for communal winter roosting from November 15 to March 15. Additionally, Tacoma has committed to conducting no timber felling or other habitat alterations within 400 feet of any known eagle nest or communal winter night roost (any season). Harassment (take) of eagles would likely occur occasionally during the Permit term during

uneven-aged harvest activities in 2,000 acres of the Conservation Zone, even-aged harvest in 3,285 acres of the Commercial Zone, road management and use including road abandonment and decommissioning associated with 113 miles of Tacoma roads, and silvicultural activities such as planting, pruning, thinning, salvage harvesting, and hardwood conversion. Nevertheless, harassment of eagles is likely to be somewhat rare.

Direct Injury or Death - No take in the form of direct injury or death of eagles is anticipated.

Bull Trout/Dolly Varden

We anticipate that an undetermined number of bull trout (bull trout and Dolly Varden are herein referred to as "bull trout" in this Incidental Take Statement) may be taken over the 50-year proposed Permit term. Take is herein anticipated for the proposed actions occurring within the 14,888 acres owned by Tacoma in the upper Green River Watershed. Specified proposed activities are anticipated to adversely affect approximately 110 miles of streams that could potentially harbor bull trout in the upper watershed on Tacoma lands. Additionally, take of bull trout is expected to occur as a result water withdrawal and habitat restoration activities within the 61 miles of the Green River mainstem below the Tacoma Headworks Dam. Bull trout are not known to currently utilize the covered lands, but will likely be found within the covered lands during the Permit term due to Tacoma proposed provision of up-stream fish passage at their diversion facility around HHD and maintaining minimum instream continuous flow in the Green River as measured at the Auburn gage. Bull trout were likely historically present in the fish-bearing streams of the upper Green River Watershed. Portions of the watershed downstream of HHD are likely currently occupied by bull trout. Future occupation of the covered lands by bull trout has several limiting factors, notably the presence of the HHD and past historical anthropogenic influences, as described in Effects of the Action.

We anticipate that impacts to bull trout would be difficult to detect at the individual organism level for the following reasons: (1) bull trout are wide-ranging and are affected by factors beyond the control of Tacoma; (2) juveniles, fry, and eggs have small body size and are, therefore, difficult to detect when alive; (3) finding dead or impaired specimens is unlikely, especially considering the often small body size of eggs and fry, denseness of vegetation/ substrate, and remoteness of the area; (4) losses may be masked by seasonal fluctuations in numbers or other causes; (5) dead or impaired specimens may be washed downstream of the site where the impact occurred; and (6) dead or impaired specimens may be consumed by other fish and wildlife species. Therefore, even though we expect incidental take to occur from the effects of the proposed action, the best scientific and commercial data available are not sufficient to enable us to estimate a specific number of individuals incidentally taken based on loss or injury of individuals of the species. For instance, if the bull trout population were to increase during the proposed Permit term, a larger number of individuals may become subject to some level of take. Consequently, take is estimated based on activities likely to result in take during the 50-year HCP period.

The incidental take over 50 years is anticipated to be in the following forms:

Harm and/or Harassment - Take of bull trout is limited to the amount that would result from activities specified in the Description of the action. Take is reduced by protections afforded to covered lands in the UMA, riparian buffers, Natural Zones, Conservation Zones, and because of road use reductions and maintenance of minimum instream flows in the Green River. Most take of bull trout in the forms of harm/harassment would occur from specified activities as: water diversions of 113 cfs from the Green River at Tacoma Headworks Dam beyond maintenance of minimum instream flows as required under the HCP; commercial logging of 3,285 acres within Tacoma's lands (Commercial Zone) managed for timber harvest; uneven-aged harvest of approximately 2,000 acres of Tacoma's lands (Conservation Zone); and the construction, maintenance, and abandonment actions associated with 113 miles of Tacoma owned roads. Most suitable bull trout habitat associated with covered lands is within protected conservation areas or riparian buffers (at least 2,125 acres of riparian buffers on the covered lands will not be harvested), substantially limiting take due to harm and/or harassment.

Degradation of habitat could occur indirectly through sedimentation and turbidity effects downstream of these lands involved in proposed activities (such as road use and maintenance), and through blockage/degradation of passage of any fish to habitat upstream (and subsequent ecological effects, such as reduced nutrient inputs to the system from salmon mortality). Take is anticipated for degradation of migration habitat: bull trout migration is adversely affected by the Tacoma Headworks facility at RM 61.0 on the Green River, and migration could be adversely affected by specified water withdrawal in some years. The Tacoma Headworks facility degrades migration potential and viability for bull trout going upstream and downstream. Approximately, 220 square miles of the Green River Watershed upstream of the facility are essentially unreachable by bull trout except via the proposed "trap and haul" facility. Degradation of downstream migration habitat is anticipated with the existing headworks facility and with proposed modifications. It is undetermined how many miles of suitable bull trout stream habitat would be indirectly affected.

Harm and harassment estimates are based on the assumption that bull trout occur throughout potential bull trout habitat in the upper Green River Watershed. Because bull trout distribution is likely not continuous, only a fraction of the stream habitat and activities described above have the potential to impact bull trout. Take is generally expected to be small. Therefore, the number of individuals likely to be subject to impacts at any particular time, or the numbers of individuals which may be taken, is small, yet unquantifiable. Estimates of indirect take are in terms of the amount of habitat affected to the extent that take could possibly occur.

Direct Injury or Death - We anticipate a small amount of direct injury or death of bull trout as a result of implementing the proposed action. Direct injury or death could occur due to instream activities, such as culvert replacement and maintenance. The level of take due to instream activities, which could result in trampling of eggs or alevins, is anticipated to be small due to the limited amount of instream work anticipated over the proposed Permit term. A small amount of

take is anticipated with the existence and proposed operation and modifications to the Tacoma Headworks facility. A small amount of take is anticipated for "trap and haul" activities as specified.

Canada Lynx

We anticipate that an undetermined number of Canada lynx (lynx) would be taken over a 50-year period as a result of the proposed action. Take is herein anticipated for the proposed actions occurring within the 14,888 acres owned by Tacoma in the upper Green River Watershed. Lynx are not known to occur on covered lands, but are known from the Green River Watershed. The number of lynx anticipated to be taken is very small, mainly because of the very small number of lynx expected to occur within the covered lands and upper Green River Watershed during the proposed Permit term, and due to the level of protection provided by the proposed HCP.

The incidental take over 50 years is anticipated to be in the following forms:

Harm and/or Harassment - Most of the covered lands are not potential habitat for lynx. Some areas will likely be used for travel by lynx, but denning and foraging in the covered lands will likely be minimal. This lack of potential or suitable denning or foraging habitat relates to elevation, climatic conditions, and vegetation of the covered lands compared to lynx habitat needs. Records indicate that lynx will travel through lower elevation areas in Western Washington (down to approximately the 2,000 foot range), but those elevations expected for denning and foraging are considered to be 3,500 feet or higher. Slightly less than half of the covered lands is above 2,000 feet and only 255 acres of covered lands is above 3,000 feet.

We anticipate all lynx in association with even-aged logging of 3,285 acres, uneven-aged logging of approximately 2,000 acres, and the construction, maintenance, and abandonment actions associated with 113 miles of Tacoma owned roads will be taken over the Permit term. The actions can adversely affect lynx prey levels, reduce the function of lynx denning habitat, or otherwise degrade lynx habitat. The FWS does not anticipate significant changes in the number or miles of roads on covered lands over the Permit term. FWS anticipates harm (take) to lynx as a result of the proposed action to be small due to restrictions on covered activities, restricted access to the watershed, limited amount of lynx denning habitat subjected to harvest (65 acres out of 255 acres potential denning on covered lands), limited amount of logging annually of approximately 100 acres, and low numbers of lynx and lynx denning expected to occur on covered lands during the Permit term.

Direct Injury or Death - We anticipate a very small amount of direct injury or death of lynx to occur from implementing proposed Covered Activities, in particular from vehicle strikes along approximately 113 miles of roads, particularly the small proportion of these roads which are at higher elevations. However, the likelihood of direct injury or death of lynx is anticipated to be very small because of road closure practices that will be implemented by Tacoma

Grizzly Bear

We anticipate that an undetermined number of grizzly bear would be taken over a 50-year period as a result of the proposed action. Take is herein anticipated for the proposed actions occurring within the 14,888 acres owned by Tacoma in the upper Green River Watershed. Grizzly bear are known from the region historically, and are currently known to occur in the Cascade Mountains to the north. They are likely to increase in number in the region and occupy the covered lands during the Permit term. Populations in the covered lands will likely remain below general biological carrying capacity for grizzly bears during the Permit term. Nevertheless, carrying capacity for grizzly bears will likely increase during the Permit term with re-establishment of wolves (carrion providers) and salmonids in the covered lands, as well as well as the functions associated with older forests. The number of grizzly bear anticipated to be taken is small, mainly because of the small number of grizzly bear expected to occur within the covered lands and upper Green River Watershed during the proposed Permit term, and due to protections and relatively limited activities proposed to occur.

The incidental take over 50 years is anticipated to be in the following forms:

Harm and/or Harassment - Most of the covered lands are potential habitat for grizzly bear, including travel, denning, and foraging. All grizzly bears associated with the even-aged logging of 3,285 acres, the uneven-aged logging of approximately 2,000 acres, and the construction, maintenance, and abandonment actions associated with 113 miles of Tacoma owned roads will be taken over the Permit term. No more than an average of 100 acres, on average, across covered lands are proposed to be logged per year of the Permit term. Approximately 3,225 acres of mid-successional forest (70 - 90 years old) in the Commercial Zone are proposed for clear-cut logging over the Permit term. Take associated with disturbance, particularly human presence and activity (associated with open road densities), will likely be the principle form of take.

Take in the form of disturbance could occur from the even-aged logging of 3,285 acres and the uneven-aged logging of approximately 2,000 acres which is expect to occur at the rate of approximately 100 acres per year over the Permit term. The construction, maintenance, and abandonment actions associated with 113 miles of Tacoma owned roads, silviculture activities, watershed operations, and aerial operations could also result in disturbance to bears. Take from at least one these activities could occur almost anywhere in the covered lands during the Permit term. Take from road associated activities would occur along approximately 113 miles of roads (with density averages ranging by zone from 2.11 to 5.57 road miles/square mile (Nature Zone-Conservation Zone) in the 14,888 acre covered lands). However, overall disturbance will be limited by Tacoma's commitment to conduct no logging, yarding, road construction, or aerial material applications within 1.0 mile of known grizzly bear dens from October 1 through May 31, and to suspend all of its forest management and road construction activities within 1.0 mile of confirmed grizzly bear sightings for 21 days. Restrictions on trash dumping and public access, and the ultimate effects of road abandonment, will further limit the potential for take. Due to the relatively limited proposed logging (an average of 100 acres per year) and other restricted human activities such as Tacoma's road closure policies, combined with the low to moderate expected

occupation of the covered lands by grizzly bear during the Permit term, we anticipate take of grizzly bear to be very small.

Direct Injury or Death - We anticipate a very small amount, if any, of direct injury or death of grizzly bear to occur from implementing proposed Covered Activities, in particular from vehicle strikes along approximately 113 miles of roads open tp vehicles authorized by Tacoma to use the roads.

Marbled Murrelet

We anticipate that an undetermined number of marbled murrelets (murrelets) would be taken over a 50-year period as a result of this proposed action. Take is herein anticipated for the proposed actions occurring within the 14,888 acres owned by Tacoma in the upper Green River Watershed. Nesting activity for murrelets is not known in the covered lands, but known for locations on adjacent properties. Most murrelet nesting will likely occur in late-seral coniferous forests of the covered lands (no logging would occur in the 5,850 acre Natural Zone). Throughout the whole covered lands, suitable habitat for nesting currently exists on 309 acres (268 acres of 106-155 year old mature coniferous forests, and 41 acres of >155 years old late-seral coniferous forests). During the 50 year Permit period, natural succession should increase nesting habitat in the covered lands to 4,319 acres (4,027 acres of 106-115 year old forest and 292 acres of >155 year old forest). Only a small portion of this 309 to 4,319 acres (as it develops over 50 years) is expected to be occupied by murrelets at any one time during the Permit period. Take of murrelets should be small, because: 1) a small number of murrelets are expected in the covered lands during the Permit period; 2) access to the whole covered lands is relatively restricted, 3) logging activities in the Natural Zone (where almost all the potential habitat occurs) are precluded; 4) logging activities in forests age classes older than 105 years old is precluded in the Conservation Zone, and; 5) of the activity restrictions specified in the Description of the Action;

The incidental take over 50 years is anticipated to be in the following forms:

Harm - All marbled murrelets associated with the even-aged logging of 3,285 acres, uneven-aged logging of approximately 2,000 acres, and the construction, maintenance, and abandonment actions associated with 113 miles of Tacoma owned roads will be taken over the Permit term. Forest stands eligible for logging in the Commercial Zone are not known to currently harbor nesting murrelets, but logging in this zone will remove 413 acres of potential/suitable nesting habitat and possibly harm nesting habitats in adjacent stands. Stands in the Conservation Zone will be subjected to pre-commercial and commercial thinning over the Permit term which could result in disturbance (take) of marbled murrelets and harm murrelets in adjacent occupied habitats by increasing windthrow exposure, reducing the amount of interior forest, and increasing the amount of edge.

Harassment - Forest stands eligible for logging in the Commercial or Conservation Zone are not known or expected to harbor nesting murrelets, but logging or thinning in this zone would

possibly disturb unknown nesting marbled murrelets in adjacent habitats. All marbled murrelets associated with the construction of new road could be taken when construction activities are adjacent to the 309 to 4,319 acres of suitable nesting habitat that is expected to be retained and develop on covered lands over the Permit term. Proposed surveys of suitable habitat, protection of occupied habitat, and seasonal and daily timing restrictions would limit take. Take of murrelets from harassment is anticipated to be small.

Direct Injury or Death - No take in the form of direct injury or death of murrelets is anticipated.

Northern Spotted Owl

We anticipate that an undetermined number of northern spotted owls (owls) would be taken over a 50-year period as a result of the proposed action. Take is herein anticipated for the proposed actions occurring within the 14,888 acres owned by Tacoma in the Upper Green River Watershed. Owl nesting activity is known in the covered lands and environs. Most N/F/R/D of owls will likely occur in mature and late-seral coniferous forests of the covered lands. Throughout the whole covered lands, suitable habitat for N/F/R/D owls currently exists on 309 acres (268 acres of 106-155 year old mature coniferous forests, and 41 acres of >155 years old late-seral coniferous forests) of the covered lands. During the 50 year Permit period, natural succession should increase N/F/R/D habitat in the covered lands to approximately 4,319 acres (4,027 acres of 106-115 year old forest and 292 acres of >155 year old forest). Only a small variable portion of this 309 to 4,319 acres (as it develops over 50 years) is expected to be occupied by owls at any one time during the Permit period. Potential F/R/D habitat (forests greater than 75 years old) for owls currently totals 4,030 acres across the covered lands, and is expected to total 5,118 acres at the end of the Permit term (Natural Zone 2,100 acres currently, and 2,441 acres and the end of the Permit term; Conservation Zone 1,080 to 1,762 acres; Commercial Zone 850 to 915 acres). Take of owls should be small, because: 1) a small to moderate number of owls are expected in the covered lands during the Permit period; 2) public access to the whole covered lands is relatively restricted, 3) logging activities in the Natural Zone are precluded; 4) logging activities in forests age classes older than 105 years old is precluded in the Conservation Zone, and; 5) of the activity restrictions specified in the Description of the Action. All spotted owls occurring within areas affected by the proposed activities specified below are anticipated to be taken.

The incidental take over 50 years is anticipated to be in the following forms:

Harm - We anticipate all northern spotted owls associated with the even-aged logging of 3,285 acres, uneven-aged logging of approximately 2,000 acres, and the construction, maintenance, and abandonment actions associated with 113 miles of Tacoma owned roads will be taken over the Permit term. This includes approximately 413 acres of (at least) marginally suitable/potential F/R/D habitat (76-105 years old) would be logged in the Commercial Zone over the 50 year Permit term. Approximately, 393 acres of the 413 acres of suitable spotted owl habitat is within 1.8 miles of one or more activity centers. No forests older than 105 years old would be logged anywhere in the covered lands during the Permit period. Some harm from this logging to

adjacent owl nesting or F/R/D habitat is likely, from increased windthrow exposure and the creation of edge.

Harassment - Forest stands eligible for logging in the Commercial or Conservation Zone are not known or expected to harbor nesting or resident owls, but logging or thinning in these zones would likely disturb foraging or dispersing owls in the area, and could disturb unknown nesting or resident owls in these stands or in adjacent habitat use areas. Road construction and road abandonment activities associated with 113 miles of Tacoma owned roads could cause disturbance of owls when adjacent to the 309 to 4,319 acres of suitable N/F/R/D habitat. We anticipated that all owls associated with the above activities will be to be taken. Proposed surveys and associated seasonal and long-term activity restrictions would limit take from disturbance associated with the even-aged logging of 3,285 acres, the uneven-aged logging of approximately 2,000 acres, the construction, maintenance, and abandonment actions associated with 113 miles of Tacoma owned roads, silviculture activities, watershed operations, aerial operations, blasting. Therefore, the take of owls from harassment is anticipated to be small.

Direct Injury or Death - No take in the form of direct injury or death of owls is anticipated.

Candidate Species and Unlisted Species

At the time of listing, FWS is to confirm the conference opinion as a biological opinion issued through formal consultation if any currently unlisted covered species becomes listed. If FWS reviews the proposed action and finds that there have been no significant changes in the action as planned or in the information used during the conference, FWS will confirm the conference opinion as the biological opinion on the project and no further section 7 consultation will be necessary.

After listing of any currently unlisted covered species, and any subsequent adoption of this conference opinion, Tacoma shall request re-initiation of consultation if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or, (4) a new species is listed or critical habitat designated that may be affected by the action.

The incidental take statement provided in this conference opinion does not become effective until the time any unlisted covered species becomes listed and the conference opinion is adopted as the biological opinion issued through formal consultation. At that time, the project will be reviewed to determine whether any take of any unlisted covered species has occurred. Modifications of the opinion and incidental take statement may be appropriate to reflect that take. Take of any newly listed covered species must not occur between the listing and adoption of the conference opinion through formal consultation, or the completion of a subsequent formal consultation.

Candidate Species

Oregon Spotted Frog (candidate species)

We anticipate that an undetermined number of Oregon spotted frogs (spotted frogs) would be taken over a 50-year period as a result of the proposed action. Spotted frogs are not known from upper Green River Watershed or covered lands, but are known historically from King County. The extent of potential or suitable spotted frog habitat in the covered lands during the Permit term is undetermined. The number of spotted frogs anticipated to be taken is small, mainly because of the small number of spotted frogs expected to occur within the covered lands during the proposed Permit term, and due to the level of protection provided by the proposed HCP. Take is herein anticipated for the proposed actions occurring within the 14,888 acres owned by Tacoma in the upper Green River Watershed.

The incidental take over 50 years is anticipated to be in the following forms:

Harm and/or Harassment - We all spotted frogs associated with the harvest activities adjacent to small wetlands (non-forested wetlands less than 0.25 acre in size) associated with the even-aged logging of 3,285 acres, uneven-aged logging of approximately 2,000 acres, and the sedimentation affects of timber harvest and the construction, maintenance, and abandonment actions associated with 113 miles of Tacoma owned roads will be taken over the Permit term. No logging activities would occur in the 5,850 acre Natural Zone. Tacoma would retain no-harvest riparian buffers along all streams and wetlands within the covered lands, varying from 25-200 feet wide based on stream type and wetland size. Therefore, most suitable spotted frog habitat on covered lands is within protected conservation areas or riparian buffers, thus take is reduced by protections afforded to the covered lands by the proposed activities/restrictions of: UMAs, riparian buffers, Natural and Conservation Zones, and road use/public access restrictions.

Degradation of habitat could occur indirectly through sedimentation and turbidity effects downstream of the lands involved in proposed activities, particularly road use and maintenance. Some take could also occur from denaturing of spotted frog riparian habitat downstream from specified water diversions of the Green River (beyond maintenance of specific minimum instream flows). It is undetermined how many acres of suitable spotted frog stream habitat would be indirectly affected by these activities.

Harm and harassment estimates are based on the assumption that spotted frog occur throughout potential spotted frog habitat in the upper Green River Watershed. Because spotted frog distribution is likely not continuous, only a fraction of the acres and activities described above have the potential to impact spotted frog. Therefore, the number of individuals likely to be subject to impacts at any particular time, or the numbers of individuals which may be taken, is small, but unquantifiable.

Direct Injury or Death - We anticipate a small amount of direct injury or death of spotted frogs as a result of implementing the proposed action. Direct injury or death could occur due to instream and near-stream activities, such as culvert and road construction/maintenance and from vehicle traffic permitted by Tacoma. The level of take due to instream/wetland located activities, which could result in trampling of eggs or individuals, and vehicle traffic is anticipated to be very small due to the minimal amount of instream/wetland work anticipated over the proposed Permit term and Tacoma road closure policies.

Unlisted Species

California Wolverine

We anticipate that an undetermined number of California wolverine (wolverines) would be taken over a 50-year period as a result of the proposed action. Take is herein anticipated for the proposed actions occurring within the 14,888 acres owned by Tacoma in the upper Green River Watershed. Wolverine are known from the region historically, are recently known to occur in the Cascade Mountains to the north, but are not known to occur in the covered lands. It is undetermined whether an increase in numbers in the region is likely (and occupation of the covered lands during the Permit term, and thus potential take), though an increase in keystone species like wolves will play a part in any wolverine increases. Populations in the covered lands will likely remain below general biological carrying capacity for wolverines during the Permit term. Nevertheless, carrying capacity for wolverines will likely increase during the Permit term with reestablishment of wolves (carrion providers) and grizzly bears (old dens), and the functions for wolverines associated with older forests. Wolverines are highly sensitive to human disturbance and activity, but it is undetermined to what extent the (comparatively infrequent) activities by Tacoma will preclude or discourage occupation by wolverines. The proposed activity levels in the covered lands may be high enough (when combined with those of surrounding landowners) to prevent frequent use of the covered lands by wolverines. The number of wolverine anticipated to be taken is small, mainly because of the assumed small number of wolverine expected to occur within the covered lands and upper Green River Watershed during the proposed Permit term, and the habitat protection measures and the restricted access measures proposed by Tacoma.

The incidental take over 50 years is anticipated to be in the following forms:

Harm and/or Harassment - Portions of the covered lands are potential habitat for wolverine, including travel, denning, and foraging. Proposed activities that could adversely affect wolverine habitat include: forest management activities (such as logging and silviculture activities), watershed operations, and road use/maintenance/construction/abandonment. No more than an average of 158 acres across the whole covered lands are proposed to be logged per year of the Permit term. Approximately 3,225 acres of the 3,858 acre Commercial Zone are proposed for clear-cut logging over the Permit term, reducing development of denning/foraging habitat over the long-term in the covered lands. Take associated with disturbance, particularly human presence and activity (generally associated with road densities), will likely be the most important

form of take. All wolverine associated with the logging and silviculture activities in the 3,285-acres Commercial Zone and 2,000 acres of the Conservation Zone, watershed operations, aerial operations, and road associated activity will be taken. Take from road associated activities would occur along approximately 113 miles of roads (with density averages ranging by zone from 2.11 to 5.57 road miles/square mile (Nature Zone-Conservation Zone) in the 14,888 acre covered lands). Overall disturbance would be limited by Tacoma's commitment to conduct no logging, yarding, road construction, aerial material applications, or blasting within 0.5 mile of known wolverine dens from October 1 through May 31. Due to the relatively limited proposed logging (approximately 100 acres per year) and restricted human activities to covered lands, combined with the low expected occupation of the covered lands during the Permit term, we anticipate take of wolverines to be very small.

Direct Injury or Death - We anticipate a very small amount, if any, of direct injury or death of wolverine to occur from implementing proposed Covered Activities, in particular from vehicle strikes along approximately 113 miles of roads open to vehicles authorized by Tacoma.

Cascades Frog

We anticipate that an undetermined number of Cascades frogs would be taken over a 50-year period as a result of the proposed action. Occupation of the covered lands is undetermined but expected; Cascades frogs are known historically from the region and likely occupied the upper Green River Watershed and covered lands historically. The extent of potential or suitable Cascades frog habitat in the covered lands during the Permit term is undetermined. The number of Cascades frogs anticipated to be taken is small, mainly because of the moderate number of Cascades frogs expected to occur within the covered lands during the proposed Permit term, and the considerable level of protection provided by the proposed HCP. Take is herein anticipated for the proposed actions occurring within the 14,888 acres owned by Tacoma in the upper Green River Watershed.

The incidental take over 50 years is anticipated to be in the following forms:

Harm and/or Harassment - We anticipate all Cascades frogs in association with the loss of habitat from timber harvest activities adjacent to riparian areas in 3,285 acres of the Commercial Zone and in 2,000 acres of the Conservation Zone will be taken. No logging activities would occur in the 5,850-acre Natural Zone. Tacoma would retain no-harvest riparian buffers along all streams within the covered lands, varying from 50-200 feet wide based on stream type. Almost all take would occur at elevations above 2,000 feet; approximately half the covered lands is above 2,000 feet elevation. Most suitable Cascades frog habitat of the covered lands is within protected conservation areas or riparian buffers, thus take will be substantially reduced, and the actual acreage of potential Cascades frog habitat likely to be directly affected by proposed activities is anticipated to small.

Degradation of habitat and the take of Cascades frogs could occur indirectly through sedimentation and turbidity effects downstream of the lands involved from the proposed covered

activities particularly road use, construction, abandonment, and maintenance. It is undetermined how many stream miles of suitable Cascades frog stream habitat would be indirectly affected by these activities.

Direct Injury or Death - We anticipate a small amount of direct injury or death of Cascades frogs as a result of implementing the proposed action. Direct injury or death could occur due to activities such as culvert and road construction/maintenance and logging in and near riparian areas and small wetlands. This take and take associated with vehicle use permitted by Tacoma is anticipated to be small due to the minimal amount of instream/wetland work anticipated over the proposed Permit term and Tacoma road closure policies.

Cascade Torrent Salamander

We anticipate that an undetermined number of Cascade torrent salamanders would be taken over a 50-year period as a result of the proposed action. Occupation of the covered lands is undetermined. Cascade torrent salamanders are not known currently or historically from the region, but they are known south of the upper Green River Watershed, from the Cascade Mountains west slope. The extent of potential or suitable Cascade torrent salamanders habitat in the covered lands during the Permit term is undetermined. If Cascade torrent salamanders exist in the covered lands, they are most likely to occur in or near forested and gravelly streams, springs, seeps, and waterfall/brook splash zones in or near Type 4 and 5 streams. Potential Cascade torrent salamanders habitat in Type 4 and Type 5 streams where the species would most likely to be found totals 417 acres. Only a small portion of this 417 acres is anticipated to be disturbed during the Permit period. The number of Cascade torrent salamanders anticipated to be taken is very small, mainly because of the very small number of Cascade torrent salamanders expected occur within the covered lands during the proposed Permit term, and the level of protection provided by the proposed HCP. Take is herein anticipated for the proposed actions occurring within the 14,888 acres owned by Tacoma in the upper Green River Watershed.

The incidental take over 50 years is anticipated to be in the following forms:

Harm and/or Harassment - We anticipate all Cascades torrent salamanders in association with the loss of habitat from timber harvest activities adjacent to riparian areas in 3,285 acres of the Commercial Zone and in 2,000 acres of the Conservation Zone will be taken. No logging activities would occur in the 5,850-acre Natural Zone. Tacoma would retain no-harvest riparian buffers along all streams within the covered lands, varying from 50-200 feet wide based on stream type. Most suitable Cascades torrent salamander habitat on the covered lands is within protected conservation areas or riparian buffers, thus take will be substantially reduced, and the actual acreage of potential Cascades torrent salamander habitat likely to be directly affected by proposed activities is anticipated to small.

Degradation of habitat could occur indirectly through loss of shade, sedimentation and turbidity effects downstream or adjacent of the lands involved in proposed activities, particularly logging and road use/construction/abandonment/maintenance. It is undetermined how many acres of

suitable Cascade torrent salamanders stream habitat would be indirectly affected by these activities.

Direct Injury or Death - We anticipate a very small amount of direct injury or death of Cascade torrent salamanders as a result of implementing the proposed action. Direct injury or death could occur due to instream/near-stream and activities, such as culvert and road construction, maintenance, and logging in small wetlands. The level of take due to instream/seep located activities, which could result in trampling of eggs or individuals, is anticipated to be small due to the minimal amount of instream/seep work anticipated over the proposed Permit term.

Coastal Cutthroat Trout

We anticipate that an undetermined number of coastal cutthroat trout may be taken over the 50-year proposed Permit term. Take is herein anticipated for the proposed actions occurring within the 14,888 acres owned by Tacoma in the upper Green River Watershed. Specified proposed activities are anticipated to adversely affect approximately 110 miles of potential occupied coastal cutthroat trout streams in the upper watershed on Tacoma lands, during various periods of the Permit term. Additionally, take of coastal cutthroat trout is expected to occur within 61.0 miles of the Green River mainstem below the Tacoma Headworks Dam. Re-establishment of anadromous populations of coastal cutthroat trout above HHD has several limiting factors, notably the presence of the Headworks Dam and HHD and the past anthropogenic influences in the upper watershed, as described in Effects of the Action.

We anticipate that impacts to coastal cutthroat trout would be difficult to detect at the individual organism level for the following reasons: (1) coastal cutthroat trout are wide-ranging and are affected by factors beyond the control of Tacoma; (2) juveniles, fry, and eggs have small body size and are, therefore, difficult to detect when alive; (3) finding dead or impaired specimens is unlikely, especially considering the often small body size of eggs and fry, denseness of vegetation/ substrate, and remoteness of the area; (4) losses may be masked by seasonal fluctuations in numbers or other causes; (5) dead or impaired specimens may be washed downstream of the site where the impact occurred; and (6) dead or impaired specimens may be consumed by other fish and wildlife species. Therefore, even though we expect incidental take to occur from the effects of the proposed action, the best scientific and commercial data available are not sufficient to enable us to estimate a specific number of individuals incidentally taken based on loss or injury of individuals of the species. For instance, if the coastal cutthroat trout population were to increase during the proposed Permit term, a larger number of individuals may become subject to some level of take. Conversely, if coastal cutthroat trout were to decrease, less take might occur. Consequently, take is estimated based on activities likely to result in take during the 50-year HCP period.

The incidental take over 50 years is anticipated to be in the following forms:

Harm and/or Harassment - Take of coastal cutthroat trout is limited to that would result from activities specified in the Description of the Action. Take is reduced by protections afforded to

the covered lands by the proposed activities of: UMA, riparian buffers, Natural Zones, Conservation Zones, road use reductions, and maintaining minimum instream flows of the Green River. All take of coastal cutthroat trout in the forms of harm/harassment would occur from specified activities of: water diversions, road maintenance, construction and use, tree harvest associated activities. Take of coastal cutthroat trout from would occur from: water diversions beyond the maintenance of minimum instream continuous flow in the Green River as measured at the Auburn gage and committed to in the HCP; commercial logging of 3,285 acres within Tacoma's lands (Commercial Zone) managed for timber harvest; uneven-aged harvest of approximately 2,000 acres of Tacoma's lands (Conservation Zone); utilization and maintenance of approximately 113 miles of roads; construction/abandonment of unspecified mileage of new/old roads. Most suitable coastal cutthroat trout habitat of the covered lands is within protected conservation areas or riparian buffers, substantially limiting take due to harm and/or harassment.

Degradation of habitat could occur indirectly through sedimentation and turbidity effects downstream of these lands involved in proposed activities (such as road use and maintenance), and through blockage/degradation of passage of any fish to habitat upstream (and subsequent ecological effects, such as reduced nutrient inputs to the system from salmon mortality). Take is anticipated for degradation of migration habitat: coastal cutthroat trout are taken by the Tacoma Headworks facility at RM 61 on the Green River, and by specified water withdrawal in some years. The Tacoma Headworks facility degrades migration potential and viability for coastal cutthroat trout going upstream and downstream; 220 square miles of the Green River watershed upstream of the facility are essentially unreachable by coastal cutthroat trout except for proposed "trap and haul" activities; degradation of downstream migration habitat is anticipated with the existing headworks facility and with proposed modifications. It is undetermined how many miles of suitable coastal cutthroat trout stream habitat would be indirectly affected. Tacoma's measure to construct and maintain a fish passage system at their Headworks facility will provide for improved access for migrating coastal cutthroat trout and minimize human handling of fish.

Harm and harassment estimates are based on the assumption that coastal cutthroat trout occur throughout potential coastal cutthroat trout habitat in the upper Green River Watershed. Because coastal cutthroat trout distribution is likely not continuous, only a fraction of the acres and activities described above have the potential to impact coastal cutthroat trout. Take is generally expected to be small. Therefore, the number of individuals likely to be subject to impacts at any particular time, or the numbers of individuals which may be taken, is small, yet unquantifiable. Estimates of indirect take are in terms of the amount of habitat affected to the extent that take could possibly occur.

Direct Injury or Death - We anticipate a small amount of direct injury or death of coastal cutthroat trout as a result of implementing the proposed action. Direct injury or death could occur due to instream activities, such as culvert maintenance. The level of take due to instream activities, which could result in trampling of eggs or alevins, is anticipated to be small due to the limited amount of instream work anticipated over the proposed Permit term. A small amount of

take is anticipated with the existence and proposed operation and modifications to the Tacoma Headworks facility. A small amount of take is anticipated for "trap and haul" activities as specified.

Common Loon

We anticipate that an undetermined number of common loons (loons) would be taken over a 50-year period as a result of this proposed action. Take is herein anticipated for the proposed actions occurring within the 14,888 acres owned by Tacoma in the upper Green River Watershed. Nesting activity for loons is currently known in covered lands; on the shores and environs of Eagle Lake and the HHD impoundment. Most loon nesting will likely occur within in the 5,850 acre Natural Zone of the covered lands, which encompasses lower elevation lands directly around the impoundment behind HHD. Some nesting is anticipated at Eagle Lake, which is surrounded by the proposed Natural Zone, Conservation Zone, and Commercial Zone. Both the HHD impoundment and Eagle Lake have activity buffers that extend upland from these water bodies for a minimum of 200 feet. Since the HHD impoundment is totally encompassed by the Natural Zone, the no-harvest buffer is much wider than 200 feet in most areas.

As specified in the Description of the Action, most activities are restricted to areas outside the Natural Zone, and public access is restricted in general. Take associated with loons should be small, because of: a) the moderate number of common loons expected in the covered lands during the Permit period; b) access to the whole covered lands is relatively restricted; c) logging activities in the Natural Zone are precluded; and d) a minimum buffer of 200 feet will be maintained around all larger water bodies.

The incidental take over 50 years is anticipated to be in the following forms:

Harm and/or Harassment - It is expected that the proposed Covered Activities would on rare occasions degrade habitat suitability of common loons. Siltation/sedimentation from roads or logging could adversely affect an undetermined amount of foraging habitat in the larger water bodies in the covered lands used by loons. Water diversion associated activities could adversely affect prey life cycles/populations levels in larger water bodies utilized by loons in the upper Green River Watershed. Harassment of common loons would likely occur occasionally during the Permit term during logging, road management, watershed operations, and silvicultural activities around Eagle Lake or HHD impoundment. Nevertheless, harassment of common loons is likely to be rare.

Direct Injury or Death - No take in the form of direct injury or death of common loons is anticipated.

Larch Mountain Salamander

We anticipate that an undetermined number of Larch Mountain salamanders would be taken over a 50-year period as a result of the proposed action. Occupation of the covered lands is undetermined. Larch Mountain salamanders are recently known in the Green River Watershed.

The extent of potential or suitable Larch Mountain salamanders habitat in the covered lands during the Permit term is undetermined. If Larch Mountain salamanders occur in the covered lands, they are most likely to occur in shady (closed canopy), moss-covered talus slopes at low to mid elevations, usually with upland plant associations. The number of Larch Mountain salamanders anticipated to be taken is small to moderate, mainly because of the moderate number of Larch Mountain salamanders expected to occur within the covered lands, and the level of protection provided by the proposed HCP. Take is herein anticipated for the proposed actions occurring within the 14,888 acres owned by Tacoma in the upper Green River Watershed.

The incidental take over 50 years is anticipated to be in the following forms:

Harm and/or Harassment - Take of Larch Mountain salamanders is limited to that which would result from activities specified in the Description of the Action. Most anticipated take would occur from clear-cut logging, road construction, and road abandonment activities. All Larch mountain salamanders associated the commercial harvest of 3,225 acres in the Commercial Zone, uneven-aged harvest of 2,000 acres in Conservation Zone, and the construction, maintenance, and abandonment actions associated with 113 miles of Tacoma owned roads will be taken. No logging activities would occur in the 5,850 acre Natural Zone. Some or most suitable Larch Mountain salamanders habitat of the covered lands is within protected conservation areas or buffers, thus potential take is reduced by protections afforded to the covered lands by the proposed activities/restrictions of: UMA, riparian buffers, Natural Zones, Conservation Zones, and Larch Mountain salamanders survey requirements/no harvest buffers/road re-routing. The actual acreage of potential Larch Mountain salamanders habitat likely to be directly affected by proposed activities is small to moderate.

Degradation of habitat could occur indirectly through loss of shade and moisture adjacent to the lands involved in proposed activities, particularly logging activities and road use, construction, abandonment, and maintenance. It is undetermined how many acres of suitable Larch Mountain salamanders stream habitat would be indirectly affected by these activities.

Direct Injury or Death - We anticipate small to moderate amount of direct injury or death of Larch Mountain salamanders as a result of implementation of the proposed action. Direct injury or death could occur due to ground disturbing activities, such as road construction, maintenance, abandonment and logging in occupied areas.

Northern Goshawk

We anticipate that an undetermined number of northern goshawks (goshawks) would be taken over a 50-year period as a result of the proposed action. Take is herein anticipated for the proposed actions occurring within the 14,888 acres owned by Tacoma in the upper Green River Watershed. Goshawk nesting is known historically from the west slope of the Cascade Mountains and currently nests in the Mt. Baker-Snoqualmie National Forest. It is currently known to nest on the covered lands and the Green River Watershed. Most nesting of goshawks will likely occur in late-seral coniferous forests of the covered lands, particularly old-growth

forests in larger patches. Throughout covered lands, suitable habitat for nesting or foraging goshawks currently exists on 309 acres (268 acres of 106-155 year old mature coniferous forests, and 41 acres of >155 year old late-seral coniferous forests) of the covered lands. During the 50 year Permit period, natural succession should increase potential nesting and foraging habitat in the covered lands to as much as 4,319 acres (4,027 acres of 106-115 year old forest and 292 acres of >155 year old forest). Only a small and variable portion of this 309 to 4,319 acres (in the oldest contiguous patches as they successionally develop over 50 years) is expected to be occupied by goshawks at any one time during the Permit period. Take of goshawks should be small, because: 1) a small (but increasing) number of goshawks are expected in the covered lands during the Permit period; 2) public access to the whole covered lands is relatively restricted, 3) logging activities in the Natural Zone are precluded; 4) logging activities in forests age classes older than 105 years old are precluded in the Conservation Zone, and; 5) of the activity restrictions specified in the Description of the Action.

The incidental take over 50 years is anticipated to be in the following forms:

Harm - We anticipate all northern goshawks associated with the even-aged logging of 3,285 acres, uneven-aged logging of approximately 2,000 acres, and the construction, maintenance, and abandonment actions associated with 113 miles of Tacoma owned roads will be taken over the Permit term. No forests older than 105 years old would be logged anywhere in the covered lands during the Permit period. Harm from fragmentation resulting from logging adjacent to goshawk nesting or foraging habitat is likely. Under proposed seasonal restrictions, Tacoma would conduct no logging, yarding, or road construction within 0.25 mile, no aerial operations within 0.50 mile, and no blasting within 1.0 mile of any known active goshawk nest annually from March 1 through August 31. Under long-term restrictions, Tacoma will conduct no logging or other habitat alterations within 660 feet of any known active goshawk nest in the covered lands, unless it has been determined that a nest has been unoccupied for 8 consecutive years. No logging activities would occur in the 5,850 acre Natural Zone, and therefore, no take of goshawks is anticipated in this zone.

Harassment - Forest stands eligible for logging in the Commercial or Conservation Zone are not known or expected to harbor nesting goshawks, but logging or thinning in these zones would likely disturb foraging or dispersing goshawks in the area, and could disturb unknown nesting or goshawks in these in adjacent habitat use areas. Some new road construction and road abandonment activities of undetermined acreage could cause disturbance of goshawks when adjacent to the 309 to 4,319 acres of suitable nesting habitat expected in the covered lands over the Permit term. Proposed surveys and associated seasonal and long-term activity restrictions would limit take from logging, yarding, road construction, silvicultural activities, and other habitat alterations, as well as aerial operations and blasting disturbances. Take of goshawks from harassment is anticipated to be small.

Direct Injury or Death - No take in the form of direct injury or death of goshawks is anticipated.

Northwestern Pond Turtle

We anticipate that an undetermined number of Northwestern pond turtles (pond turtles) would be taken over a 50-year period as a result of the proposed action. Pond turtles are not known from upper Green River Watershed or covered lands, but are known historically and currently from the region. Pond turtles likely occupied the upper Green River Watershed and covered lands historically. This species inhabits permanent or intermittent ponds, lakes, and rivers, near banks or in quiet backwaters where there is a relatively slow current, basking sites, and refugia. The extent of potential or suitable pond turtle habitat in the covered lands during the Permit term is undetermined. The number of pond turtles anticipated to be taken is very small, mainly because of the moderate number of pond turtles expected to occur within the covered lands during the proposed Permit term, and due to the considerable level of protection provided by the proposed HCP. Take is herein anticipated for the proposed actions occurring within the 14,888 acres owned by Tacoma in the upper Green River Watershed.

The incidental take over 50 years is anticipated to be in the following forms:

Harm and/or Harassment - All northwestern pond turtles associated with, commercial logging of 3,285 acres outside riparian buffers; uneven-aged harvest of approximately 2,000 acres outside of riparian buffers; and the construction, maintenance, and abandonment actions associated with 113 miles of Tacoma owned roads will be taken. Most suitable pond turtle habitat of the covered lands is within protected areas or buffers, thus take will be substantially reduced by protections afforded by the proposed activities/restrictions of: UMA, riparian/wetland buffers, Natural Zones, Conservation Zones, wetland Type A and B road construction restrictions, and road use/public access restrictions.

Degradation of habitat could occur indirectly through sedimentation and turbidity effects downstream of the lands involved in proposed activities, particularly road use and maintenance. Some take could also occur from dewatering of pond turtle riparian/open water habitat downstream from specified water diversions of the Green River (beyond maintenance of specific minimum instream flows). It is undetermined how many acres of suitable pond turtle stream habitat would be indirectly affected by these activities.

Direct Injury or Death - We anticipate a very small amount of direct injury or death of pond turtles as a result of implementing the proposed action. Direct injury or death could occur due to instream and near-stream activities, such as culvert and road construction/maintenance. The level of take due to instream/wetland located activities, which could result in trampling/crushing of eggs or individuals, is anticipated to be very small due to Tacoma's road closure policy and the minimal amount of instream/wetland work anticipated over the proposed Permit term and.

Olive-sided Flycatcher

We anticipate that an undetermined number of olive-side flycatchers (flycatchers) would be taken over a 50-year period as a result of the proposed action. Take is herein anticipated for the proposed actions occurring within the 14,888 acres owned by Tacoma in the upper Green River

Watershed. Flycatcher nesting is known historically from the west slope of the Cascade Mountains and currently nests in the Mt. Baker-Snoqualmie National Forest. Most nesting of flycatchers will likely occur in late-seral coniferous forests with abundant dead trees near open wetland areas of the covered lands. Throughout the whole covered lands, suitable habitat for nesting and foraging flycatchers currently exists on an undetermined acreage. Forest stands most suitable for nesting or foraging likely occur within and adjacent to 309 acres (268 acres of 106-155 year old mature coniferous forests, and 41 acres of >155 year old late-seral coniferous forests) of greater than105 year old forests and adjacent to open wetlands of the covered lands. During the 50 year Permit period, natural succession should increase these >105 year old forest to 4,319 acres (4,027 acres of 106-115 year old forest and 292 acres of >155 year old forest). Only a small and variable portion of this 309 to 4,319 acres is expected to be occupied by flycatchers at any one time during the Permit period. Take of flycatchers should be small, because: 1) a small number of flycatchers are expected in the covered lands during the Permit period; 2) logging activities in the Natural Zone are precluded; 3) logging activities in forests age classes older than 105 years old is precluded in the Conservation Zone, and; 4) protective buffers adjacent to wetlands; and 5) of the activity restrictions specified in the Description of the Action.

The incidental take over 50 years is anticipated to be in the following forms:

Harm - We anticipate all olive-side flycather associated with the even-aged logging of 3,285 acres, uneven-aged logging of approximately 2,000 acres, and the construction, maintenance, and abandonment actions associated with 113 miles of Tacoma owned roads will be taken over the Permit term. No forests older than 105 years old would be logged anywhere in the covered lands during the Permit period. Even though Tacoma has committed to retaining all safe snags (including a minimum of 2-6 snags created/retained per acre harvested), some harm from loss of snags is likely. No logging activities would occur in the 5,850 acre Natural Zone, therefore no take is anticipated to occur is this zone.

Harassment - Forest stands eligible for logging in the Commercial or Conservation Zone may harbor nesting flycatchers, and logging or thinning in these zones would likely disturb nesting, foraging or dispersing flycatchers in the area. Some new road construction and road abandonment activities of undetermined acreage could cause disturbance of flycatchers when adjacent to the 309 to 4,319 acres of suitable nesting habitat expected in the covered lands over the Permit term. Take of flycatchers from harassment is anticipated to be small.

Direct Injury or Death - No take in the form of direct injury or death of flycatchers is anticipated.

Pacific Fisher

We anticipate that an undetermined number of Pacific fisher (fisher) would be taken over a 50-year period as a result of the proposed action. Take is herein anticipated for the proposed actions occurring within the 14,888 acres owned by Tacoma in the upper Green River Watershed. Fisher are known from the region historically and are recently known to occur in the Cascade Mountains to the south in Oregon, but are not known to currently occur in covered lands. The fisher is

closely associated with large, contiguous blocks of mature and old-growth forest. With the fisher close to extirpation in Washington, it is undetermined whether any increase in numbers in the region is likely in the next 50 years (and considerable occupation of the covered lands during the Permit term, and thus potential take). Populations in the covered lands will likely remain below general biological carrying capacity for fishers during the Permit term; nevertheless, carrying capacity for fishers will likely increase during the Permit term with the expected reestablishment of wolves (carrion providers) and the functions for fishers associated with late- seral unmanaged contiguous forests. The number of fisher anticipated to be taken is very small, mainly because of the assumed very small number of fisher expected to occur within the covered lands and upper Green River Watershed during the proposed Permit term, and due to the relatively limited activities proposed to occur.

The incidental take over 50 years is anticipated to be in the following forms:

Harm and/or Harassment - We anticipate all Pacific fisher associated with the even-aged logging of 3,285 acres, uneven-aged logging of approximately 2,000 acres, and the construction, maintenance, and abandonment actions associated with 113 miles of Tacoma owned roads will be taken over the Permit term. No forests older than this105 years old class would be logged anywhere in the covered lands during the Permit period. Even though Tacoma has committed to retaining all safe snags (including a minimum of 2-6 snags created/retained per acre harvested), harm from loss of snags is likely. No logging activities would occur in the 5,850 acre Natural Zone. Take in the form of disturbance could occur from: logging and silviculture activities, watershed operations, aerial operations, and road associated activity. Take from road associated activities could occur along approximately 113 miles of roads. However, take will be limited by seasonal restrictions around fisher dens, including no logging, yarding, road construction, or aerial operations within 0.50 mile of any known fisher den from February 1 to July 31. Due to the relatively limited proposed logging and other restricted human activities in the covered lands, combined with the low expected occupation of the covered lands during the Permit term, we anticipate take of fisher to be very small.

Direct Injury or Death - No take in the form of direct injury or death of fisher is anticipated

Pacific Lamprey/River Lamprey

We anticipate that an undetermined number of Pacific lamprey/river lamprey (lamprey) may be taken over the 50-year proposed Permit term. Take is herein anticipated for the proposed actions occurring within the 14,888 acres owned by Tacoma in the upper Green River Watershed. Specified proposed activities are anticipated to adversely affect approximately 110 miles of potential occupied lamprey streams in the upper watershed on Tacoma lands, during various periods of the Permit term. Additionally, take of lamprey is expected to occur within 61 miles of the Green River mainstem below the Tacoma Headworks Dam. Lamprey are not known to currently utilize the covered lands. The likelihood of lampreys being found within the covered lands and upper Green River Watershed during the Permit term is undetermined. Lamprey were likely historically present throughout the fish-bearing streams of the upper Green River

Watershed. Future occupation of the covered lands by lamprey has several limiting factors, notably the presence of the HHD and past historical anthropogenic influences, as described in Effects of the Action and Environmental Baseline.

The incidental take over 50 years is anticipated to be in the following forms:

Harm and/or Harassment - Take of lamprey is limited to that which would result from activities specified in the Description of the Action. Take is expected to be small to moderate, and would be reduced maintaining minimum instream flows of the Green River. Most take of lamprey in the forms of harm/harassment would occur from d activities of associated with the operation of Headworks facility including water diversions. All lamprey associated with water diversions beyond the maintenance of minimum instead continuous flow in the Green River as measured at the Auburn and Palmer gage and committed to in the HCP; construction and operations associated with Tacoma's Green River diversion facility will be taken.

Lamprey migration may be adversely affected by the Tacoma Headworks facility at RM 61.0 on the Green River, and migration could be adversely affected by specified water withdrawals in lower river some years. The Tacoma Headworks facility degrades migration potential and viability for lamprey going upstream cutting 220 square miles of the Green River watershed upstream of the facility because lamprey will not be collected at the trap and haul facility and transported to the upper watershed.

Direct Injury or Death - We anticipate a small amount of direct injury or death of lamprey as a result of implementing the proposed action. A small amount of take is anticipated with the existence and proposed operation and modifications to the Tacoma Headworks facility and due to water withdrawal activities. A very small amount of take is anticipated for "trap and haul" activities as specified.

Peregrine Falcon

We anticipate that an undetermined number of peregrine falcons (falcons) would be taken over a 50-year period as a result of this proposed action. Take is herein anticipated for the proposed actions occurring within the 14,888 acres owned by Tacoma in the upper Green River Watershed. Nesting activity for falcons is not currently known for covered lands. The acreage and extent of key habitat features for falcons in the covered lands and upper Green River Watershed, including cliffs and rock outcrops (potential nesting habitat), natural open areas (grass-for meadows and persistent shrub communities), open water, and open wetlands (palustrine emergent and palustrine scrub-shrub) used for foraging, is undetermined.

The incidental take over 50 years is anticipated to be in the following forms:

Harm - It is expected that the proposed Covered Activities would on rare occasions degrade habitat suitability of falcons. The acreage of falcon habitat features that would likely be adversely affected is undetermined, but considered to be small. We anticipate all peregrine

falcons associated with the even-aged logging of 3,285 acres, uneven-aged logging of approximately 2,000 acres, and the construction, maintenance, and abandonment actions associated with 113 miles of Tacoma owned roads will be taken over the Permit term. All known falcon nest sites and potential nesting cliffs will on covered lands will be surrounded by a no-harvest buffers 100 feet wide. In addition, Tacoma will retain all large, dominant trees that are significantly larger than the surrounding forest stand out 660 feet from potential nesting cliffs. Suitable falcon nesting and foraging habitat on covered lands that is within protected conservation areas or riparian/species buffers will not be subject to covered activities, and thus take is not expected to occur in association with UMA, riparian buffers, Natural Zones, and, Conservation Zones. The amount of take from harm is anticipated to be small.

Harassment - Harassment, in the form of disturbance of an undetermined number of roosting or nesting falcons, is anticipated to occur. Harassment of falcons would likely occur occasionally during the Permit term during aerial operations, uneven-aged harvest activities in 2,000 acres in the Conservation Zone, even-aged harvest of 3,285 acres in the Commercial Zone, road management, use, abandonment, decommissioning of 113 miles of roads, and silvicultural activities if and when these activities are conducted near unknown falcons. Nevertheless, harassment of falcons is likely to be rare.

Direct Injury or Death - No take in the form of direct injury or death of falcons is anticipated.

Pileated Woodpecker

We anticipate that an undetermined number of pileated woodpeckers would be taken over a 50-year period as a result of this proposed action. Take is herein anticipated for the proposed actions occurring within the 14,888 acres owned by Tacoma in the upper Green River Watershed. Nesting activity for pileated woodpecker is expected in the covered lands. Most pileated woodpecker nesting will likely occur in late-seral forests of the covered lands. Foraging would mostly occur in mature and late-seral forests. Throughout the whole covered lands, suitable habitat currently exists on approximately 309 acres (268 acres of 106-155 year old mature coniferous forests, and 41 acres of >155 years old late-seral coniferous forests). During the 50 year Permit period, natural succession should increase foraging or nesting habitat in the covered lands to 4,319 acres (4,027 acres of 106-115 year old forest and 292 acres of >155 year old forest). Only a small portion of this 309 to 4,319 acres (as it develops over 50 years) is expected to be occupied by pileated woodpeckers at any one time during the Permit period. Take of pileated woodpeckers should be small, because: 1) a moderate number of pileated woodpeckers are expected in the covered lands during the Permit period; 2) logging activities in the Natural Zone are precluded; 3) logging activities in forests age classes older than 105 years old is precluded in the Conservation Zone, and; 5) of the activity restrictions specified in the Description of the Action.

The incidental take over 50 years is anticipated to be in the following forms:

Harm - We anticipate all pileated woodpeckers associated with the even-aged logging of 3,285 acres, uneven-aged logging of approximately 2,000 acres, and the construction, maintenance, and abandonment actions associated with 113 miles of Tacoma owned roads will be taken over the Permit term. No forests older than 105 years old would be logged anywhere in the covered lands during the Permit period. Short-term reductions of habitat suitability is expected to occur as a result of even-aged harvest in the Conservation Zone, but the purpose of harvest in this zone is to accelerate the development of mature and late-seral forest characteristics preferred by pileated woodpeckers.

Harassment - Some portion of forest stands eligible for logging in the Commercial or Conservation Zone are expected to harbor nesting and foraging pileated woodpeckers, and logging (including thinning) in these zones would possibly also disturb nesting pileated woodpeckers in adjacent older forests. Some new road construction could cause take of pileated woodpeckers when adjacent or within the 309 to 4,319 acres of foraging or nesting habitat expected in the covered lands over the Permit term. Proposed surveys and associated restrictions would limit take. Take of pileated woodpeckers from harassment is anticipated to be small.

Direct Injury or Death - A small amount of take in the form of direct injury or death of pileated woodpeckers could anticipated through loss of nests from road and logging activities. Thus, take associated with these covered activities is expected to be low.

Tailed Frog

We anticipate that an undetermined number of tailed frogs would be taken over a 50-year period as a result of the proposed action. Tailed frogs are known from the upper Green River Watershed but surveys have not been conducted for them on covered lands. Tailed frogs likely occupied the upper Green River Watershed and covered lands historically. The extent of potential or suitable tailed frog habitat in the covered lands during the Permit term is undetermined. Tailed frogs are expected in, or within a few hundred feet (in wetter areas) of cold, swift cascading, rock-strewn, permanent non-fish bearing streams surrounded by mature or late-successional conifer forests. The number of tailed frogs anticipated to be taken is small, mainly because of the moderate number of tailed frogs expected to occur within the covered lands during the proposed Permit term, and due to the level of protection provided to likely stream habitats by the proposed HCP. Take is herein anticipated for the proposed actions occurring within the 14,888 acres owned by Tacoma in the upper Green River Watershed.

The incidental take over 50 years is anticipated to be in the following forms:

Harm and/or Harassment - We anticipate all tailed frogs in association with the loss of habitat from timber harvest activities adjacent to riparian areas in 3,285 acres of the Commercial Zone and in 2,000 acres of the Conservation Zone will be taken. No logging activities would occur in the 5,850-acre Natural Zone. Tacoma would retain no-harvest riparian buffers along all streams within the covered lands, varying from 50-200 feet wide based on stream type. Most suitable tailed frog habitat on the covered lands is within protected conservation areas or riparian buffers,

thus take will be substantially reduced, and the actual acreage of potential tailed frog habitat likely to be directly affected by proposed activities is anticipated to small.

Degradation of habitat could occur indirectly through loss of shade, sedimentation and turbidity effects downstream or adjacent of the lands involved in proposed activities, particularly logging and road use/construction/abandonment/maintenance. It is undetermined how many acres of suitable Tailed frog stream habitat would be indirectly affected by these activities.

Degradation of habitat could occur indirectly through loss of shade and moisture in adjacent areas, as well as sedimentation and turbidity effects downstream of the lands involved in proposed activities, particularly road construction, use, and maintenance. It is undetermined how many acres of suitable tailed frog stream habitat would be indirectly affected by these activities.

Direct Injury or Death - We anticipate a very small amount of direct injury or death of tailed frogs as a result of implementing the proposed action. Direct injury or death could occur due to instream and near-stream activities, such as culvert and road construction/maintenance. The level of take due to instream and near stream located activities, which could result in trampling of eggs or individuals, is anticipated to be very small due to the minimal amount of work in these areas anticipated over the proposed Permit term.

Van Dykes Salamander

We anticipate that an undetermined number of Van Dyke's salamanders would be taken over a 50-year period as a result of the proposed action. Occupation of covered lands is undetermined. The extent of potential or suitable Van Dyke's salamander habitat in the covered lands during the Permit term is undetermined. Van Dyke's salamanders are expected to occur under rocks and in very large fallen decaying logs along stream banks in mature and old-growth coniferous forests, usually associated with headwater streambank or seeps. The number of Van Dyke's salamander anticipated to be taken is small to moderate, mainly because of the moderate to high number of Van Dyke's salamanders expected occur within the covered lands, and the level of protection provided by the proposed HCP. Take is herein anticipated for the proposed actions occurring within the 14,888 acres owned by Tacoma in the upper Green River Watershed.

The incidental take over 50 years is anticipated to be in the following forms:

Harm and/or Harassment - All Van Dyke's salamander associated with the commercial logging of 3,285 acres outside riparian buffers; uneven-aged harvest of approximately 2,000 acres outside of riparian buffers; and the construction, maintenance, and abandonment actions associated with 113 miles of Tacoma owned roads will be taken. The actual acreage of Van Dyke's salamander habitat likely to be directly affected by proposed activities is small.

Degradation of habitat could occur indirectly through loss of shade and moisture adjacent of thelands involved in proposed activities, particularly logging activities and road use,

construction, abandonment, and maintenance. It is undetermined how many acres of suitable Van Dyke's salamander stream habitat would be indirectly affected by these activities.

Direct Injury or Death - We anticipate small to moderate amount of direct injury or death of Van Dyke's salamanders as a result of implementation of the proposed action. Direct injury or death could occur due to ground disturbing activities, such as logging and road construction, maintenance, abandonment, and logging in occupied areas.

Vaux's Swift

We anticipate that an undetermined number of Vaux's swifts (swifts) would be taken over a 50-year period as a result of this proposed action. Take is herein anticipated for the proposed actions occurring within the 14,888 acres owned by Tacoma in the upper Green River Watershed. Nesting activity for swifts is expected in the covered lands, and known from the Green River Watershed. Most swift nesting will likely occur in late-seral forests of the covered lands. Most foraging in the covered lands will occur high in the air over a variety of terrains and vegetation types as well at lower levels in forest openings, above any burns, and especially above rivers; no take of foraging swifts is anticipated. Throughout the whole covered lands, suitable nesting habitat currently exists on approximately 41 acres of >155 years old late-seral forests. During the 50 year Permit period, natural succession should increase nesting habitat in the covered lands to 292 acres of >155 year old forest. Take of swift should be small, because: 1) a small number of swifts are expected in the covered lands during the Permit period; 2) logging activities in the Natural Zone are precluded; 3) logging activities in forests age classes older than 105 years old is precluded in the Conservation Zone, and; 5) of the activity restrictions specified in the Description of the Action;

The incidental take over 50 years is anticipated to be in the following forms:

Harm - We anticipate all Vaux's swifts associated with the even-aged logging of 3,285 acres, uneven-aged logging of approximately 2,000 acres, and the construction, maintenance, and abandonment actions associated with 113 miles of Tacoma owned roads will be taken over the Permit term. Forest stands eligible for logging in the Commercial Zone or Conservation Zone do not likely harbor nesting swifts, but logging and silvicultural practices in this zone will likely harm nesting habitats in adjacent stands (mainly through loss of snags for safety reasons and increased windthrow exposure). No forests older than 105 years old would be logged anywhere in the covered lands during the Permit period. Some large snags (danger trees) within 150 feet of roads are expected to be felled. New road construction could cause the removal of potential nest snags.

Harassment - Logging (including thinning) in the Commercial or Conservation Zone in this zone could disturb nesting swifts in adjacent older forests. Some new road construction could cause take of swifts when adjacent or within the 41 to 292 acres of potential nesting habitat expected in the covered lands over the Permit term. Take of swifts from harassment is anticipated to be very small.

Direct Injury or Death - A very small amount of take in the form of direct injury or death of swifts is anticipated through loss of nesting snags from road and logging activities.

EFFECT OF THE TAKE

Listed Species/Critical Habitat:
In the accompanying BO, FWS determined that this level of anticipated take is not likely to result in jeopardy to marbled murrelet, northern spotted owls, bald eagle, grizzly bear, gray wolf, Canada lynx, or bull trout. NMFS has made the same determination for Puget Sound Chinook salmon in it's BO for the proposed HCP and related Agreements (NMFS 2001).

The FWS believes the levels and forms of incidental take authorized in this Biological and Conference Opinions are not likely to jeopardize the continued existence of any currently listed species. Further, the incidental take authorized here-in will not substantially reduce the size, distribution, or productivity of the local, regional or range-wide populations of these species. In fact, FWS expects that the proposed action will result in population increases at the local and possibly regional scales when compared to baseline conditions absent the HCP.

Other Covered Species – Not Listed as Threatened or Endangered:
In the accompanying Conference Opinion, FWS determined that this level of anticipated take is not likely to result in jeopardy to the following currently unlisted, covered species: common loon, peregrine falcon, northern goshawk, olive-sided flycatcher, pileated woodpecker, Vaux's swift, Pacific lamprey, river lamprey, Pacific fisher, California wolverine, Cascades Frog, Cascade torrent salamander, Larch Mountain salamander, Oregon spotted frog, tailed frog, Van Dyke's salamander, northwestern pond turtle, coastal cutthroat trout, and Dolly Varden.

Reasonable and Prudent Measures & Terms and Conditions
The proposed HCP and accompanying Agreements identify anticipated impacts to all Covered Species likely to result from the proposed actions and the specific measures and levels of species and habitat protection that are necessary and appropriate to minimize those impacts. All of the conservation and management measures of the HCP and accompanying Agreements, together with the terms identified in the associated IA, are hereby incorporated by reference as reasonable and prudent measures and terms and conditions for this incidental take statement pursuant to 50 CFR 402.14(I). Such terms and conditions are non-discretionary and must be undertaken by Tacoma for the exemptions under section 10 (a)(1)(B) and section 7 (o)(2) of the Act to apply. If Tacoma fails to adhere to these terms and conditions the protective coverage of the section 10 (a)(1)(B) permit and section 7 (o)(2) may lapse.

Further, the following Terms and Conditions apply to the Service after issuance of the permit:

1. The FWS shall provide technical assistance to Tacoma throughout the term of the incidental take permit described in the HCP and IA;

2. The FWS shall conduct regular compliance monitoring exams and review periodic, scheduled monitoring reports, and;

3. The FWS will, at the time of listing of any of the 19 currently unlisted covered species, reassess the analysis in this Biological and Conference Opinion, and determine whether continued implementation of the HCP and permit would jeopardize the existence of any Covered Species.

Reporting Requirements

In accordance with 50 CFR 402.14 (I)(3), the HCP and accompanying Agreements specify provisions for monitoring and reporting the effects and effectiveness of the mitigation and minimization measures on the covered species and their habitats. Tacoma will also submit periodic monitoring reports to FWS, according to the monitoring and reporting schedule contained in the HCP and IA.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, help implement recovery plans, or to develop information.

The FWS recommends the applicant consider the following additional actions to promote the recovery of federally listed species and their habitats:

1. Tacoma continue to work with surrounding landowners, municipalities, and regulatory entities to develop a comprehensive, regional strategy for water supply that results in sustainable use of water resources and contributes to the recovery of listed fish and other aquatic life forms.

2. Tacoma is to notify FWS of occurrences of all species which have disturbance restrictions under the HCP. These species include marbled murrelets, northern spotted owls, bald eagles, grizzly bears, gray wolves, Northern goshawks, Pacific fishers, peregrine falcons, and California wolverines.

In order for FWS to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, FWS requests the applicant to provide notification of the implementation of any conservation recommendations.

RE-INITIATION NOTICE

This concludes formal consultation and conference on implementation of the Tacoma Water HCP: Green River Water Supply Operations and Watershed Protection. As provided in 50 CFR §402.16, re-initiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or, (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending re-initiation.

At the time of listing, FWS is to confirm the conference opinion as a biological opinion issued through formal consultation if any currently unlisted covered species becomes listed. If FWS reviews the proposed action and finds that there have been no significant changes in the action as planned or in the information used during the conference, FWS will confirm the conference opinion as the biological opinion on the project and no further section 7 consultation will be necessary.

After listing of any currently unlisted covered species, and any subsequent adoption of this conference opinion, Tacoma shall request re-initiation of consultation if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or, (4) a new species is listed or critical habitat designated that may be affected by the action.

The incidental take statement provided in this conference opinion does not become effective until the time any unlisted covered species becomes listed and the conference opinion is adopted as the biological opinion issued through formal consultation. At that time, the project will be reviewed to determine whether any take of any unlisted covered species has occurred. Modifications of the opinion and incidental take statement may be appropriate to reflect that take. Take of any newly listed covered species must not occur between the listing and adoption of the conference opinion through formal consultation, or the completion of a subsequent formal consultation.

If you have any questions regarding these biological and conference opinions, please contact Tim Romanski at (360) 753-5823.

for Ken S. Berg

cc: FWS, OSO (R. Szlemp)
NMFS, Lacey (M. Longenbaugh, S. Landino)
Tacoma (J. Kimer)

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